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THE PULMONARY CIRCULATION—BEFORE AND AFTER HARVEY*

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(*Concluded from p. 5*)

The literature of the pulmonary circulation alone is now so vast that all I can hope to do is to give a brief review of some of its more important practical aspects.

Anatomy of the Pulmonary Blood Supply

The advances made in the surgery of the thoracic organs have focused attention on the gross and minute anatomy of the lung and its vascular supply. Dr. W. Snow Miller (1937) has published a most valuable and beautifully illustrated book on this subject which it is a joy to study. He points out that the pulmonary artery in branching follows the subdivisions of the bronchial tree. At first the artery and the bronchus are about equal in diameter; but the subdivisions of the artery get smaller than the bronchi, and at the lobule the artery is only one-fourth or one-fifth the size of the alveolar duct. Here it divides into as many branches as there are atria. Each atrial artery breaks up into branches to supply the air sacs, and these in turn divide to supply the air cells, there subdividing to form the capillary network, the richest and finest in the body, though the capillary meshwork is coarser in the air cells beneath the pleura and in those abutting on connective-tissue septa. The capillary network is so placed that it has air on both sides. The pulmonary veins, in contrast with the arteries, do not accompany the bronchi and are placed as far from them as possible.

The bronchial arteries have been the subject of much research. They vary in number and in their place of origin. In the lungs they enter the peribronchial connective tissue and divide with the bronchi as far as the smaller bronchioles, where they cease. The question of anastomosis between the pulmonary and bronchial arteries has been much discussed. It is generally agreed that there is no anastomosis between the arteries, but that there is direct communication between the capillary systems and that the blood from the bronchial artery is in part returned by the pulmonary veins. Miller has shown that the bronchial arteries also supply the vasa vasorum of the pulmonary artery. Miller states that wounds of the bronchial artery are much more fatal than those involving branches of the pulmonary artery, owing to the higher blood pressure. The problem of this connexion between the two vascular supplies has been studied experimentally in animals. Berry, Brailsford, and Daly (1931) confirm that there is a functional anastomosis between the two systems, but only through the capillaries, and state that changes in bronchial arterial pressure can lead to changes in pulmonary arterial pressure and pulmonary venous flow. They point out that this vascular shunt must not be forgotten in considering the hydrodynamics of the pulmonary circulation.

It is well known that there are no valves in the pulmonary veins. At the same time the supply of blood to the right side of the heart is greatly aided by the efficient action of the valves in the jugular and subclavian veins, and by those in the veins from the lower extremities in maintaining the filling of what Keith has called the "venous cistern." This comprises the superior and inferior venae cavae, and the innominate, iliac, hepatic, and renal veins, the total capacity of which he estimates as 400 to 500 c.cm. This cistern is subject to the aspirating effects of the inspiratory movements, and is also further fed by the pumping or "milking" effect of the limb muscles when they are in action.

Changes in the Blood in the Pulmonary Circuit

The change in colour from venous to arterial blood was known to the earliest observers, and certainly to Galen, but the actual demonstration of the cause of the change was slow in achievement, and not complete until Lavoisier's researches.

The investigation of the gaseous transfer in the lungs between the blood and the alveolar air redounds again to the credit of English physiologists—notably the Haldanes, the Barcrofts, and their pupils—though they are among the first to acknowledge the achievements of Continental and American authorities, particularly Bohr, Henderson, Krogh, van Slyke, and Zuntz. The factors influencing these exchanges are of great interest. In the first place we may consider the extent of the capillary surface in the lungs and the manner in which this is exposed to the alveolar gases. It is estimated that there are about 700,000,000 alveoli in the human lungs, and that the blood is exposed to these gases over an area of 90 square metres (roughly about 1,000 square feet). The surface to which the 3,000 c.cm. of air in the lungs in the condition of moderate distension is exposed is clearly enormous. It is estimated by Maximow that the total area of the capillaries in the alveolar walls is 140 square metres. These figures must of necessity be to some extent conjectural and at best approximate, but in any case they give some idea of the possibilities of exchange between the blood in the capillaries and the alveolar air.

* The Harveian Oration (abridged), delivered to the Royal College of Physicians of London on December 15, 1939.

At rest in man about 250 c.cm. of oxygen is absorbed and about 200 c.cm. of CO_2 is given out per minute. Loewy and Zuntz calculate that under the conditions of gas pressure in the lungs 6,100 c.cm. of oxygen could be absorbed per minute, which gives some idea of one aspect of the enormous safety margin of the pulmonary functions.

A further demonstration of the efficiency of the mechanism for gaseous exchange is afforded by the observation that during exercise venous blood may contain only 5 c.cm. of O and up to 65 c.cm. of CO_2 per 100 c.cm.; yet in arterial blood coming from the lungs the gaseous content is restored to the levels in the resting state, although the actual time the blood is in the pulmonary capillaries is one second or less. In that brief time the blood becomes 95 per cent. saturated with oxygen. Another interesting fact is that the diffusion constant for carbon dioxide is from twenty to thirty times greater than that of oxygen, and Haldane has shown that the oxygen reaching the blood helps to drive out the carbon dioxide. He has also revived a suggestion, originally made by Ludwig, that the alveolar walls may exert some direct influence other than physical on the gaseous exchange. He has brought forward some evidence that this may be of a secretory nature in regard to oxygen. This claim has been adversely criticized by Barcroft and other physiologists.

When it is realized that with violent muscular exertion the gaseous exchange is increased tenfold or more it becomes obvious that there must be some rapidly acting adjustments by which more blood can be passed through the lungs and exposed to the alveolar air when necessary. It is estimated that at the height of inspiration the lungs contain about one-twelfth of the total blood of the body, and that in expiration this is reduced to one-fifteenth or even one-eighteenth, while with increased heart rate the amount may reach as much as one-fifth. An even more striking illustration of the adaptability of the pulmonary circuit is afforded by the study of the cardiac output under varying conditions. It is calculated that at rest the stroke volume of the heart is about 70 c.cm., and the output per minute about 5 litres; this may be increased on exercise to 30 litres. As the total volume of blood in man is roughly 5 litres, it means that the heart can circulate this full amount six times in one minute when the activities of the body demand it, a remarkable tribute to its efficiency as a pump.

The Lungs as Blood Depots

Barcroft (1934) defines a blood depot as an organ which can, and at times does, contain a large quantity of blood capable of being diverted for use elsewhere. One of the first organs he studied was the spleen, which supplies extra blood to the right auricle on exertion. The lungs have been much discussed as possible depots. As we have seen, Malpighi suggested they were designed "as if for a storehouse of blood." Magnus in 1930 and Hochrein and Keller in 1932 came to the conclusion that the lungs served as a blood store, and Sjöstrand in the same year brought forward experimental evidence in favour of this view.

The circulation has been observed microscopically in the mammalian lung by Hall in 1925 and more recently by Wearn and his collaborators (1934). The results obtained are of great interest, especially as supporting the depot function of the lungs. Wearn found that the flow in the arterioles was sometimes pulsatile, more often steady, but frequently changing from one to the other. The corpuscle content of the plasma in an arteriole may vary from being closely packed to single file. Spontaneous reversal of direction of current may be seen in arterioles. After adrenaline an arteriole with red cells in single file dilated and allowed eight or more abreast. Spontaneous opening and closing of capillaries was common. These experiments afford some idea of the capillary reserve of the lungs, since the number of capillaries through which blood is flowing at a given time may obviously be only a small fraction of the total. The changes in the capillary patterns in the lungs would therefore appear to be kaleidoscopic in their variety.

It has recently been shown by Howell and Donahue (1937) that the blood in the pulmonary artery is richer in blood platelets than that brought to the lungs by the pulmonary veins. They have found megakaryocytes in the lung tissue, and thus demonstrated another function in which the lungs seem to act reciprocally with the spleen. Other activities which have been accredited to the lung are the capacity to destroy lactic acid (Eppinger) and activity in the metabolism of fat (Roger).

Mechanics of the Pulmonary Circulation

The first attempts to study the pulmonary blood pressure in animals were made in 1852 by Beutner under Ludwig's direction. Fredericq improved on Beutner's method. Chauveau and Marey's classical observations on intracardiac pressures were recorded in 1863.

Our knowledge has been greatly extended by Tigerstedt, Wiggers, Hochrein, Daly, and Starling, whose experimental genius stimulated many co-workers. I can only refer to the barest details of some of the more important results, especially those of immediate practical significance. Wiggers (1921) estimates the systolic pressure in the pulmonary artery under normal conditions as varying between 60 and 32 mm. Hg, with an average of 44 mm.; the diastolic pressure ranging between 21 and 6 mm., with an average of 12 mm. Matthes and Hochrein give closely similar figures—namely, average systolic 49 mm. and diastolic 12 mm. Hg. It is noteworthy that the pulse pressure is therefore about 30 to 34 mm. Hg; in other words, it is much more than the diastolic pressure. Another important point is that the average pressure in the pulmonary artery is about one-sixth of the aortic pressure.

The pressure in the pulmonary veins at their junction with the left auricle is assumed to be at or near atmospheric pressure and certainly slightly more than that in the auricle. The capillary pressure is also a matter of assumption. It must be less than the minimum diastolic pressure of 5 mm., and is probably between 3 and 5 mm.

The short course of the pulmonary artery and of its two divisions, together with the rapid subdivision of the intrapulmonary branches to form a quickly widening course on the arterial and capillary side, as well as the shorter extent of the whole circuit, serves to explain the lower pressures and greater velocity of the blood in the pulmonary circulation. Wiggers points out that variations in pulmonary pressures depend upon three factors—the output of the right ventricle, the changes in resistance and capacity in the pulmonary circuit, and "back-pressure" effects from the left side of the heart. This "back working," recognized by Hope but denied by Mackenzie, is now generally accepted by cardiologists as a very important factor in circulatory failure in disease.

The difficult problems of the double circulation become slightly clarified if it is realized that in health the output of the two ventricles per beat must be equal, except for

brief periods of adjustment, and that the systemic circulation can only be effective if the left ventricle is adequately supplied from the lungs, while the right ventricle can only deliver the varying quantity needed if the venous return is effective and adequate, which in turn depends chiefly upon the efficiency of the systemic circulation—the *vis a tergo*, a factor which was recognized by Lower and thoroughly understood by Hope. The adequate filling of the right side of the heart is therefore a primary essential for an efficient circulation; in other words, it is the right or weaker side of the heart which calls the tune and in some senses sets the pace.

An important factor in the adjustment of the two circuits is the great capacity of the lungs to accommodate extra blood, storing it temporarily and passing it on to the left side of the heart as needed. In this connexion it is interesting to note that ligature of one pulmonary artery causes only a temporary rise of pulmonary pressure, and one lung is capable almost at once of dealing with the blood that formerly went to both—a matter of vital importance in connexion with such operations as lobectomy or unilateral pneumonectomy. Another proof of the reserve of the pulmonary mechanism is afforded by the researches of Dunn, who showed that considerable areas of the pulmonary circulation could be blocked by artificial emboli with no more than a temporary fall of pulmonary blood pressure.

The time relations of the pulmonary circulation in man have been studied by Blumgart (1931) and his associates by ingenious methods. The total circulation time from arm to arm varies from twelve to twenty-four seconds, with an average of eighteen seconds; the time from arm to heart, two to fourteen seconds, with an average of 6.6 seconds; and the "crude pulmonary time," five to seventeen seconds, with an average of 10.8 seconds. These methods are proving of clinical application and value, since the pulmonary time is greatly increased in cases of pulmonary venous engorgement.

Control of the Pulmonary Circulation

Since the heart is a double pump maintaining two circuits, separate yet mutually dependent, the two primary essentials for its efficient action must be adequate filling of the right ventricle and effective force of the heart muscle, each factor controlled and regulated to supply the varying needs of the different organs and tissues. It is not surprising, therefore, that mechanical factors play an important part in its control. The filling of the right side of the heart depends upon an adequate pressure in the great veins. The main factor in this is sufficient force on the part of the left ventricle, the *vis a tergo*, transmitted through the capillaries and veins. This is greatly aided by the effect of the respiratory movements on the intrathoracic pressures, constituting what Leonard Hill has called "the respiratory pump," which serves to assist in supplying the venous cistern and in promoting the effective filling of the right heart in diastole. It has been suggested by Eppinger that from 6 to 25 per cent. of the total volume of the venous input is due to this pumping action of respiration. It is well known that there is a rise of the systemic blood pressure with inspiration, though this is slightly delayed. It is therefore at first sight surprising that there is a fall of blood pressure in the pulmonary artery with inspiration, due, according to Sharpey-Schafer and Daly, to diminished peripheral resistance in the lung when it is moderately expanded. Cloetta explains this as being due to the radial traction of the alveoli on the vessels.

Variation in the degree of filling of the right side of the heart is the chief factor in adjustment, alteration in the rate of the heart being secondary to it and effected by reflex nervous mechanisms. Wiggers states that the right auricle contracts a fraction of a second before the left. The manner of the passage of the blood into the ventricles is interesting. In the early period of diastole filling is rapid because the pressure in the ventricle as it relaxes is low; then there is a period of slower entry of blood because the pressures in the veins and ventricle are nearly equal; then there is the short auricular systole, which is said to be responsible for from 20 to 35 per cent. of the ventricular contents.

It is now generally accepted that the rhythm of the heart is myogenic, and that the pace-maker is the sino-auricular node. As long ago as 1881 Ludwig and Luchsinger affirmed that tension inside the heart is a powerful stimulus to its rhythm. Starling by his brilliant researches elaborated this into his well-known "law of the heart." In his Harveian Oration he propounded that "the energy of contraction is thus a function of the diastolic volume of the heart."

Nervous Factors

These are complex but of great interest, since they are for the most part automatic and are brought into play chiefly by the pressure changes in the heart and in the vessels. One of the most dramatic of these is the "Bainbridge reflex." In 1915 Bainbridge demonstrated that increased pressure in the right auricle brought into action a reflex mechanism accelerating the heart rate. This has been shown to be due largely to diminished vagus inhibition, but also in part to increased cardio-accelerator action. A corresponding mechanism on the systemic arterial side was demonstrated by Hering in 1924. He showed that increase in the pressure in the carotid sinus caused slowing of the heart and a fall in blood pressure. This has proved to be due partly to increased vagus inhibition and partly to diminished accelerator action. It is now known that similar reflexes are activated by pressure changes in the aorta and in the heart itself. These are believed to be put in action by "stretch receptors" in these situations, and the afferent paths are through the glosso-pharyngeal and depressor or aortic nerves. It is evident that this is the basis of Marey's law (1859) that a rise of blood pressure tends to slow the heart.

Recent researches by Heymans and other Belgian investigators indicate that changes in blood pressure can by similar reflex paths in these same nerves influence the rate of respiration, a fall of blood pressure stimulating respiration.

Vasomotor Supply to the Pulmonary Vessels

The lungs were supposed to be free of vasomotor nerves until Brown-Séquard in 1871 demonstrated their existence. Even then these results were much questioned. Important work in this connexion was carried out in this country by Bradford and Dean, and in 1890 Dr. James Andrew in his Harveian Oration referred to their results. Later Sharpey-Schafer and McDowall, and more recently Daly and Euler, have investigated them. There seems no doubt now that there is a definite and effective vasoconstrictor supply through the sympathetic system. Hochrein and Keller suggest that its chief use is to subserve the "shunt" activities of the pulmonary vessels in regard to its reservoir or "depot" function. The existence of vasodilators is still in doubt, though the evidence supports the view that there is a parasympathetic supply of this nature.

It seems certain that the pulmonary capillaries are not passive tubes. They undergo active changes in calibre, as observed by Krogh (1929). I have already referred to these as actually seen by Wearn and his collaborators. It was at first supposed that these variations were due to the contractile cells in the capillary walls described by Rouget in 1873. Changes in surface tension in the capillary walls have also been regarded as responsible. These explanations must be considered as doubtful, and there is accumulating evidence that the changes are due to nervous and chemical control.

Little is known of vasomotor supply to veins, but there seems some reason to believe that they have a vasomotor supply and that they may be influenced by the reflex mechanism of the carotid sinus.

Chemical Factors in Regulation

The suggestion that the action of the vasomotor nerves might be due to an adrenaline-like substance liberated at the nerve endings was made by T. R. Elliott in 1904. Cannon subsequently called the substance "sympathin." Loewi in 1921–6 revived and greatly extended this conception of humoral transmission, and it has been studied in this country by Dale and his collaborators with very interesting results.

It would seem in general that the sympathetic endings are activated by an adrenaline-like substance, and are therefore called "adrenergic," while the parasympathetic endings and the motor nerve endings in voluntary muscle are susceptible to acetylcholine, and are therefore called "cholinergic." It is difficult to determine the effects of adrenaline and acetylcholine on the pulmonary vessels because of their coincident effects on the heart and the systemic and coronary vessels. Adrenaline can constrict the pulmonary arterioles and raise the pressure in the pulmonary artery, but it can sometimes produce dilatation, though this effect is apparently more marked in the capillaries. The action of acetylcholine varies with the dose, a dilatation of the vessels occurring with small and a constriction with large doses.

Histamine is normally present in the lung. Its effect is different upon the pulmonary vessels, which it constricts, from that on the systemic, which it dilates. The part played by Sir Henry Dale in the investigation of the problems of humoral transmission it would be difficult to overestimate. It was recognized by the award of the Nobel Prize in 1936. These researches illustrate the paramount importance biochemistry is taking on in the elucidation of physiological and pathological problems.

Adjustments of the Two Circulations

Although the two circulations are so closely dependent on each other there is a remarkable independence in regard to the respective arterial pressures in health. Considerable rises can take place in the systemic arterial pressure with little or no effect upon the pulmonary pressure levels, and the lungs can undoubtedly protect the left side of the heart from overdistension by shunting large quantities of blood into the pulmonary veins and capillaries. It is only when the left ventricle fails that the "back-working" effects become serious, increasing the pulmonary pressures, and decreasing the velocity of flow while increasing the right ventricle contractions and engorging the lung.

I have endeavoured to give a very brief description of the imposing edifice which has been built by Harvey's successors on one part of the foundation he laid so successfully. There is still much to be done, and no doubt some parts to pull down and rebuild. We must always keep open minds and be prepared to modify and adapt as new facts come to light.

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NOTES ON PENETRATING CHEST WOUNDS

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The following notes are based on over six hundred cases treated at base hospitals in France and England in 1917 and 1918. They may prove of some value to a new generation of medical officers who will presumably be called upon to treat large numbers of similar cases in the immediate future.

The following table shows the relative frequency of the various complications occurring either singly or in combination in a consecutive series of 250 cases seen at an advanced base hospital in France. Of these 75 per cent. were admitted during the first week and 90 per cent. within fourteen days of being wounded.

	No.	Per cent.
Haemothorax and pneumo-haemothorax:		
Simple 143 (57.2%)		
Infected 39 (15.6%)	182	72.8
Empyema (without obvious haemothorax) ..	9	3.6
Pneumothorax (without obvious haemothorax) ..	3	1.2
Pleural effusion (simple)	3	1.2
Homolateral collapse (deflated lung)	24	9.6
Contralateral collapse	16	6.4
Bronchopneumonia and capillary bronchitis ..	10	4.0
Lobar pneumonia	7	2.8
Pericarditis (purulent)	2	0.8
Septicaemia	2	0.8
Mediastinal abscess	1	0.4
Tetanus	1	0.4
Deaths from all causes while under treatment	12	(4.8%)
Transferred to England	238	(95.2%)

Twenty-four cases of non-penetrating wounds or wounds in which penetration was doubtful are included in this series because in all such cases injury involved either the lungs or pleura, as shown by haemoptysis, pleurisy, or pulmonary collapse. Cases seen at a later stage (over 350) at a base hospital in England are not included in the above list, as certain temporary complications—for example, collapse of lung—would have disappeared before the patients came under observation.

The after-history of cases which survive to reach the base emphasizes the great difference in outlook between wounds caused by bullets and those produced by fragments of shell. A simple "e. and e." wound from a machine-gun or rifle bullet which drills a clean hole through clothing, chest wall, and lung substance but fails to penetrate the heart or a big vessel causes remarkably few symptoms after the initial shock and rarely produces sepsis. Apart from temporary haemoptysis and haemothorax—which, unless large, is better left alone—the patient suffers relatively little inconvenience and rapidly

becomes convalescent. In the case of shell wounds the outlook is much more serious. Apart from the greater injury to the lung by laceration and the more frequent presence of a fragment of shell-casing in the chest, grave secondary infection of the pleura almost invariably results from the introduction of portions of dirty clothing, etc., into the wound.

Simple Haemothorax

The physical signs of a simple haemothorax are similar to those of an ordinary pleural effusion, except that, owing probably to the greater density of the fluid, loud bronchial or tubular breath sounds are frequently heard. The diagnosis is usually self-evident, but in case of doubt can be confirmed by exploratory puncture. As the contents of the haemothorax form an excellent medium for the growth of organisms exploration should be avoided if possible, and only be carried out with meticulous care. Repeated exploration is neither necessary nor advisable. Unless the effusion of blood is large enough to cause respiratory embarrassment aspiration is better avoided.

Prognosis.—In the case of perforating lung wounds with simple haemothorax the prognosis is eminently good, and complete functional efficiency appears to result in the great majority of cases. A remarkable example of this was provided by a man who had four Turkish machine-gun bullets through his chest—two through the upper lobe of each lung—in 1916, and was admitted to a base hospital in France just over a year later with a wound of the arm incurred in trench warfare.

Infected Haemothorax

Streptococci and anaerobic gas-producing organisms are mainly responsible for infection. *B. coli* infections occurred in several cases. The physical signs are the same as in a simple haemothorax, except that in the presence of gas-producing organisms the area of hyperresonance, absence of breath sounds, and presence of coin sound may indicate a pyopneumothorax. The symptoms are those of an ordinary empyema—pyrexia, sweating, dirty tongue, malaise, etc. Pain is a doubtful guide, as it will probably be present in any case from the wound in the chest wall. In anaerobic infection the symptoms are very severe. The patient becomes extremely ill, and unless operation is immediately performed the outlook is hopeless. In the case of a single wound in the chest wall the diagnosis of infected haemothorax is simple. The physical signs, together with smears from aspirated blood, settle the matter at once. In the case of multiple wounds, especially if they make it difficult to examine the base of the lungs, the symptoms may be attributed to other areas of infection and the haemothorax be entirely overlooked. It must always be remembered that often the chest is penetrated by missiles entering either at the root of the neck or in the upper abdomen or lumbar region. I have seen a number of such cases in which dullness and tubular breathing at the base accompanied by pyrexia have been wrongly attributed to a secondary pneumonia following on wounds in other areas. When heavy fighting is in progress and streams of wounded are coming through such mistakes are easily made.

Empyema.—Empyema in which the amount of blood effused into the thorax was negligible occurred in only nine cases (3.6 per cent.) of the above series. Large collections of pus lying free in the pleural cavity call for no particular comment and do not present any special difficulty in diagnosis. Other cases in which a small localized empyema is formed from the breaking down of lacerated lung, especially if interlobar, may cause great uncertainty. If there are one or more other infected wounds which might account for pyrexia and other symptoms the equivocal physical signs in the chest may make it almost impossible to be sure whether an empyema exists or not. The sudden onset of peculiarly offensive breath, if unaccompanied by any notable amount of sputum to suggest abscess or gangrene of the lung, may indicate that a small empyema is threatening to burst into a bronchial tube. This occurred in more than one case in the present series, in which, strangely enough, no case of pulmonary abscess or gangrene was seen. Each case of empyema must be taken on its merits and the site of the pus determined by careful examination and intelligent exploration. *X*-ray examination if available may help, but does not necessarily afford conclusive evidence.

Treatment of Infected Haemothorax and Empyema

In cases in which a bullet or shell fragment is shown by *x*-ray film to be lying free in the pleural cavity or near the surface of the lung, resection of rib, removal of the foreign body, and evacuation and drainage of the pleural cavity are obviously indicated. In cases in which it is not proposed to remove a foreign body resection of rib was the accepted treatment in the last war ; but I feel strongly that some less drastic method is advisable in the majority of cases, at any rate in the early stages. As the result of haemorrhage, shock, exposure, exhaustion, and subsequent infection many of these cases arrive at the base in a critical condition and are ill fitted to stand the ordeal of a general anaesthetic and resection of rib. and if possible it should be avoided. Any form of treatment must not only ensure efficient drainage but should promote the rapid expansion of lung by preventing air suction through the wound during inspiration. In order to effect this many cases were treated in the last war by closing the resection wound firmly round a large thick-walled long drainage tube which was itself firmly stitched to the skin and allowed to hang over the side of the bed into a vessel containing an antiseptic fluid. This method has nothing to recommend it, for the simple reason that the constant dragging of the heavy tube on the inflamed skin stitch-holes produces continuous and intolerable pain. It is mentioned here only to be condemned.

An ideal method of drainage would be to introduce through a small stab wound in the intercostal space a large flexible self-retaining catheter, using a local or very brief general anaesthetic and attaching the catheter to a continuous suction apparatus—a method of treatment that has proved eminently successful in the empyemas of civil life. As the necessary suction apparatus is not likely to be available in sufficient quantity to deal with the large number of cases inevitable in warfare, a simple method which was found very effective in the war of 1914–18 seems to be indicated. The finger of a rubber glove with the end cut off is tied round the end of a thick-walled drainage tube, which is then passed through a hole in the centre of a six-inch square of jaconet or thin rubber sheeting. The edge of the aperture in the jaconet is firmly bound round the end of the drainage tube over the rubber finger. This simple apparatus can be used in conjunction with resection or be inserted through a stab incision in an intercostal space. While it allows free drainage during expiration, air is prevented from entering through the tube during inspiration by collapse of the rubber finger and from entering round the tube by the close apposition of the sheet of jaconet to the chest wall. Drainage by this method will prove effective

in the majority of cases without resection, and in the few in which this is ultimately required the patient is in far better condition to stand the operation later. Daily irrigation with warm Dakin's solution keeps the cavity clean and appears to hasten the disintegration of fibrin.

Fresh-air Treatment of Infected Haemothorax

During the early summer of 1917 certain desperately ill patients suffering from infected haemothorax in process of drainage were treated experimentally in the open air under awnings. The improvement was so remarkable that whenever circumstances allowed all such cases were subsequently treated in the same way, with equally satisfactory results. The value of fresh-air treatment was shown in another way at a Red Cross hospital devoted entirely to chest wounds, in the autumn of 1918 during the epidemic of influenza. One patient developed the disease and promptly died, whereupon as a preventive measure all windows were either kept permanently open or were removed entirely from their frames: the wards were stripped of all but bare essentials in the way of furniture and sprayed daily with a solution of chloride of lime. This regime was kept up during the whole of the ensuing winter, and though influenza was rampant at the time no further case occurred. The first case was the last.

Prognosis in Infected Haemothorax

Of thirty-three cases ten (30 per cent.) were fatal—six out of twenty cases of streptococcal or mixed streptococcal and anaerobic infection, and four cases out of thirteen due to anaerobes only. I feel that if some effective form of closed drainage on the lines indicated above could be universally employed to replace open resection when it is not proposed to remove a foreign body the results would be much better. In cases that survive the early stages convalescence should be shorter and the final result better owing to earlier and more complete expansion of the lung on the affected side. The early routine use of polyvalent anti-gas-gangrene serum in cases due to anaerobes should also be helpful.

Pneumothorax

Pneumothorax as demonstrated by hyperresonance, absence of breath sounds, and presence of coin sound may be due to perforation of lung, to gas formation by anaerobic infection of a haemothorax, or to the presence of a valvular flap wound of the chest wall allowing air to enter during inspiration but blocking its exit during expiration. Haemothorax due to either of the first two was never very large in the above series of cases. In one very extensive pneumothorax due to a flap wound the amount of air expelled through an aspirating needle and drainage tube was measured and found to displace over two litres of water from inverted bottles. The obvious treatment in such a case is resection and repair of the flap wound in the chest wall.

Homolateral Collapse: Deflated Lung

Following certain wounds of the chest wall, notably contused shell wounds over the base, examination of the underlying lung reveals dullness on percussion with loss of breath sounds and absence of vocal fremitus and vocal resonance, signs taken together strongly suggestive of fluid. Aspiration, however, is negative, and *x*-ray examination shows slightly increased density of lung shadow, a high diaphragm moving on respiration, but no sign of fluid. The lung appears to be stunned by the concussion and temporarily thrown out of action. The condition clears up in a few days and requires no treatment. Though more common in non-penetrating wounds, it occurs occasionally in wounds which actually expose the pleural cavity without producing a haemothorax. Non-penetrating wounds with deflated lung are often mistaken temporarily for penetrating wounds with haemothorax.

Contralateral Collapse

In this condition the physical signs are in strong contrast to those of homolateral deflation. At the end of a few days or a week after injury the base of the lung on the opposite side becomes dull on percussion, with loud tubular breathing, pectoriloquy, and increase of vocal resonance and fremitus. Fine crepitations occur in a few cases, but are more commonly absent. The physical signs are strongly suggestive of pneumonic consolidation, but symptoms of pneumonia are entirely absent. There is no pain, fever, increase of dyspnoea, or subjective symptoms of severe illness, apart from those incidental to the wound on the opposite side. On *x*-ray examination the dome of the diaphragm is seen to be much raised, up to about the level of the fourth rib, but still moves on respiration, indicating that contralateral collapse is a condition arising in the lung itself and not the result of diaphragmatic paralysis. The abnormal physical signs disappear within about a week, and the condition requires no special treatment.

Early Closure of Penetrating Chest Wounds

In 1917, when investigations were being made into the early closure of wounds, many cases of penetrating chest wounds were treated in this way immediately on arrival at a casualty clearing station, the wound in the chest wall being widely resected, a portion of the rib removed, the contents of the pleura swabbed out, and the chest wound firmly closed. While a certain number were extremely successful, others which afterwards developed infection of the pleura broke down, with deplorable results. A large open sucking wound was produced which either proved fatal or took many weeks to heal. Of a series of sixteen cases which arrived at the base after early closure eleven were quite successful, five broke down as described above, and two were fatal. Thus 31 per cent. of early-closure cases became infected, as opposed to 21 per cent. in cases not so treated, and the death rate of infected cases was 40 per cent. as opposed to 30 per cent. So far as it goes this small number of cases suggests that the early closure of penetrating chest wounds is a very doubtful procedure.

Morphine in the Treatment of Chest Wounds

In the first-aid treatment of chest wounds morphine in adequate doses is of vital importance. In reply to a question on this point my friend Mr. J. S. Levis, *M.C.*, speaking with the authority of four years' experience in front-line areas, summarizes the position as follows. "If they don't get enough morphine to stop restlessness and haemorrhage they won't live to get down to the base. If the first half-grain doesn't knock them out give them the other half." Later on, at the base hospital, morphine or one of its derivatives, though not in such heroic doses, is no less valuable to ensure a reasonable amount of sleep in spite of the pain and general mental and physical distress associated with a severe penetrating chest wound, and may be given without the slightest fear of any harmful effects. Omnopon (allopon) appears to be more satisfactory than plain morphine in that it produces less unpleasant after-effects. Though I must have prescribed many hundreds of doses of morphine and omnopon to these cases I have never yet seen it do anything but good.

TREATMENT WITH SULPHAPYRIDINE (M & B 693) OF GUINEA-PIGS INFECTED WITH BRUCELLA ABORTUS

BY

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AND

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In a previous paper (Wilson and Maier, 1939) evidence was brought to show that the administration of sulphanilamide twice daily in a dosage bordering on the toxic limit to guinea-pigs infected seven weeks previously with a virulent strain of *Br. abortus* was able to bring about sterilization of the tissues after treatment for three to five weeks. The total daily dosage used corresponded to an average of 0.8 mg. per gramme of body weight. Animals given half this dosage still remained infected after two to four weeks' treatment.

These results receive confirmation from the work, in the United States, of Chinn (1939), who, starting treatment one week after inoculation with *Br. abortus, Br. melitensis,* or *Br. suis,* and using twice-daily doses of sulphanilamide amounting in the aggregate to 1 mg. per gramme of body weight, achieved sterilization of the tissues in twenty-one out of twenty-eight guinea-pigs treated for twenty-four days. On the other hand, they are quite incompatible with the findings of Menefee and Poston (1939), who started treatment five days after a large inoculation with *Br. melitensis,* gave a dosage of sulphanilamide of only 0.06 mg. per gramme of body weight (60 mg. per kilo) for ten days and then 0.03 mg. per gramme for a further ten days, and succeeded in sterilizing the tissues of nineteen out of twenty infected guinea-pigs. Since Chinn found that animals infected with *Br. melitensis* tended to be more refractory to treatment than those infected with *Br. abortus* or *Br. suis,* the most probable explanation of Menefee and Poston's results is that they were using a comparatively avirulent strain of *Br. melitensis.*

These results are conflicting, but on the whole it looks as if successful treatment of guinea-pigs infected with Brucella can be achieved by sulphanilamide only after prolonged treatment with large doses. Since sulphapyridine is said to be less toxic than sulphanilamide (Wien, 1938), it seemed desirable to make observations on this drug in the hope that cure might be obtained without the risk of poisoning the animals. The following experiments were therefore undertaken.

Experiment 1

On March 17, 1939, fourteen male and fourteen female guinea-pigs, weighing between 240 and 520 grammes, with an average weight of 340 grammes, were inoculated intramuscularly into the left thigh with 1,000,000 living organisms washed off from a two-day liver-agar culture of a virulent CO_2-sensitive strain of *Br. abortus* (Lanyon). They were then divided up into five groups, A, B, C, D, and E, of approximately equal weight. Groups A, B, and D contained each two bucks and two does, Group C contained three bucks and three does, and Group E, representing the control group, contained five bucks and five does.

Six weeks later, April 27, treatment of the first four groups was begun. It was originally intended to give Groups A, B, and C 200-mg. doses of sulphapyridine (2-sulphanilyl-aminopyridine) by mouth *twice a day* on six days a week for two, four, and six weeks respectively, but owing to the acute toxaemic death of one animal on the fourth day of treatment, and the partial paralysis of some of the others, the dosage was halved for a few days. It was later increased to 150 mg. twice a day, and then, on account of the death of two more animals from presumably chronic toxaemia, it was again reduced to 100 mg. twice a day. The dosage of the individual animals was varied considerably according to their condition, and sometimes had to be stopped for two or three days at a time. The sulphapyridine, which had been dispensed in tablets, was given in powdered form by means of a special glass funnel introduced into the mouth at the back of the tongue. Following the practice of Chinn (1939) it was washed down with two or three drops of 5 per cent. glucose solution.

The treatment of Group D had similarly to be altered. It was intended to give these animals subcutaneous inoculations, *twice daily* on six days a week for a fortnight, of 100 mg. of soluble sulphapyridine, made up in a 33⅓ per cent. solution, but owing to the acute toxaemic death of one animal on the fourth day of treatment the dosage was halved. Many of the animals in this group developed dry gangrene of the extremities, and when half of them were killed after a fortnight they were found to be suffering from large axillary abscesses containing necrotic masses of tissue. For this reason the injections were discontinued and the remaining animals were given two daily doses of 100 mg. of sulphapyridine by the mouth for another fortnight. Half the animals in Groups A, B, and C and all the animals in Group D were killed the day after their last dose; the other half were killed a week later. Two to five control animals were killed at the same time as each subgroup of infected animals.

In making the bacteriological examination the animal was anaesthetized with ether, the thorax opened, and blood taken for agglutination from the inferior vena cava. The great vessels were then cut and the animal was allowed to bleed to death. The spleen and sublumbar glands were excised, ground up separately in Griffith tubes, and suspended in N/4 Ringer solution; viable bacterial counts were then made on the suspensions by the roll-tube method. In addition the macroscopic appearance of the glands, spleen, and liver was carefully noted, particular attention being paid to the degree of enlargement of the organ as a whole and to the number and size of any focal lesions that might be present. The results were recorded in a series of index numbers varying from 0 to 4. The summarized results are given in Table I. (The figures in both tables represent arithmetic mean values, with the exception of agglutinin titres, for which the geometric mean has been used.)

The macroscopic appearance of the sublumbar glands did not differ greatly in the treated and control animals, but the involvement of the spleen and liver, particularly in Groups A, B, and C, was considerably less than in the corresponding controls. Bacteriologically the sublumbar glands proved sterile in all the treated animals except two belonging to Group A. The spleens of two animals in Groups B and D and of all animals in Group C were likewise sterile. The sublumbar glands of three of the control animals proved sterile, but the spleens were all heavily infected. The agglutinin titres varied greatly from animal to animal, but were lowest in Group C. Little difference was observed between the animals killed the day after and those killed a week after the cessation of treatment, suggesting that the effect of the drug was well maintained. It is worth noting that two animals in Group B and two in Group C showed no macroscopic lesions whatever and yielded no growth of *Br. abortus* on culture.

There is little doubt, from this experiment, that the treatment with sulphapyridine favourably influenced the course of the infection. The treatment with the soluble product, especially when followed by sulphapyridine by mouth, gave much the same results as treatment for the same length of time by oral administration.

TABLE I.—*Experiment 1: Comparison of Treated and Control Guinea-pigs*

Group	Average Daily Dosage	Treated								Control (Group E)						
		No. of Animals	Average Weight of all Animals at Start	Macroscopic Index Nos. (Maximum 4)			Colonies		Agglut. Titre	No. of Animals	Macroscopic Index Nos. (Maximum 4)			Colonies		Agglut. Titre
				Subl.	Spl.	Liver	Subl.	Spl.			Subl.	Spl.	Liver	Subl.	Spl.	
A	200 mg. sulphapyridine for 2 weeks	4	345 gm.	0.75	1.0	0.25	310	1,440	1 4,280	3	1.0	3.0	1.3	3,730	39,000	1 18,940
B	230 mg. sulphapyridine for 4 weeks	4*	335 gm.	0.5	0.25	0	0	130	1 3,200	2	1.0	3.0	1.5	500	55,000	1 1,630
C	210 mg. sulphapyridine for 6 weeks	5†	330 gm.	0.2	0.4	0.2	0	0	1/420	5	1.2	2.4	1.2	920	16,000	1 12,800
D (1)	90 mg. sulphapyridine soluble for 2 weeks ..	1†	300 gm.	1.0	2.0	1.0	0	1,410	1 3,200	2	1.0	3.0	1.5	370	23,000	1 14,600
D (2)	110 mg. sulphapyridine soluble for 2 weeks, 190 mg. sulphapyridine for 2 weeks ..	2	395 gm.	1.0	1.5	0	0	0	1 11,320	1	1.0	3.0	2.0	1,000	72,000	1 830

Subl.=Sublumbar glands. Spl. Spleen.

* Including two animals that died 1 to 5 days after the cessation of treatment. † Excluding one animal that died of acute toxaemia.

Note.—The three control animals for Group D were the same as two for Group A and one for Group B.

Experiment 2

This experiment differed from the first only in that treatment was begun three days instead of six weeks after infection. On April 24, 1939, fourteen male and fourteen female guinea-pigs, weighing between 230 and 390 grammes, with an average weight of 270 grammes, were inoculated intramuscularly into the left thigh with 1,400,000 living organisms washed off from a two-day liver-agar culture of *Br. abortus* (Lanyon). The guinea-pigs were then divided into five groups as before, the only difference being that the numbers of animals in Groups B and C were interchanged, B having three bucks and three does, and C two bucks and two does. Treatment of Groups A, B, C, and D was begun on April 27, the dosage being approximately the same as in the first experiment. The animals in Group E were left as controls.

One male in Group B died of acute toxaemia on the third day of treatment and was discarded. One female in Group B died of subacute toxaemia two days before the end of treatment, and one male in Group B died from the same cause a week after the cessation of treatment. One female in Group B died from presumably chronic toxaemia a day after the cessation of treatment. These three animals are included in the analysis of the results, which are summarized in Table II.

The macroscopic lesions were on the whole considerably less in the treated than in the control animals. Bacteriologically the sublumbar glands were sterile in all animals in Groups B and D, in all but one in Group C, and in one animal in Group A. The spleen was sterile in all animals in Group C, in all but one in Group B, and in two animals in Group D. In all the control animals both the sublumbar glands and the spleen were heavily infected. The agglutinin titres varied greatly from animal to animal, but were very much lower in all the treated groups than in the control group. Little difference was observed between the animals killed a day after and those killed a week after the cessation of treatment, except in the A group, in which the infection seemed to progress somewhat after the drug had been stopped.

It may be noted that three animals in Group B, one in Group C, and one in Group D showed no macroscopic lesions whatever and yielded no growth of *Br. abortus* on culture. One of the three animals in Group B likewise gave a negative agglutination reaction, showing, therefore, no sign of infection whatever. These results are on the whole similar to those in the first experiment.

Discussion

It was both surprising and disappointing in these experiments to find that sulphapyridine was so toxic to guinea-pigs. According to Wien (1938) the toxicity of this drug for rats is only about one-quarter that of sulphanilamide. The acutely toxic dose for rats and mice is stated by Wien to be about 16 mg. per gramme of body weight; yet in our experiments two guinea-pigs died of acute toxaemia on the third and fourth days of treatment respectively after

TABLE II.—*Experiment 2: Comparison of Treated and Control Guinea-pigs*

Group	Average Daily Dosage	Treated								Control (Group E)						
		No. of Animals	Average Weight of all Animals at Start	Macroscopic Index Nos. (Maximum 4)			Colonies		Agglut. Titre	No. of Animals	Macroscopic Index Nos. (Maximum 4)			Colonies		Agglut. Titre
				Subl.	Spl.	Liver	Subl.	Spl.			Subl.	Spl.	Liver	Subl.	Spl.	
A	200 mg. sulphapyridine for 2 weeks	4	295 gm.	1.0	0	0.25	460	24,200	1/280	2	1.0	1.0	2.0	16,200	37,200	1 2,300
B	230 mg. sulphapyridine for 4 weeks	5*	280 gm.	0	0	0	0	19	1/16	3	1.0	2.0	2.0	8,500	116,000	1 4,000
C	220 mg. sulphapyridine for 6 weeks	4	285 gm.	0.25	0.5	0.75	20	0	1/55	5	1.0	2.4	0.8	910	29,500	1 7,700
D (1)	110 mg. sulphapyridine soluble for 2 weeks ..	2	305 gm.	0.5	0.5	0	0	2,750	1/350	1	1.0	1.0	3.0	15,700	12,700	1 3,200
D (2)	110 mg. sulphapyridine soluble for 2 weeks, 230 mg. sulphapyridine for 2 weeks ..	2	255 gm.	0	0	0.5	0	0	1/70	2	1.0	1.0	2.5	10,500	45,200	1 4,500

Subl.=Sublumbar glands. Spl.=Spleen.

* Excluding one animal that died of acute toxaemia, but including one animal that died two days before the end of treatment, and two that died one to seven days after cessation of treatment.

Note.—The three control animals for Group D were the same as one for Group A and two for Group B.

receiving by the mouth a total daily dose of only 1.5 mg. per gramme. It is interesting to note that one of these animals showed on post-mortem examination extensive retroperitoneal haemorrhages in the lumbar region, free blood in the bladder, and large soft friable kidneys filled in the dilated pelvic portion with greyish stony deposits. The formation of urinary calculi after oral administration of sulphapyridine has been reported by Antopol and Robinson (1939) and by Gross and Cooper (1939) in rats, rabbits, and monkeys, but this is the first time, so far as we are aware, that it has been reported in guinea-pigs.

Two other animals died of subacute toxaemia after receiving by mouth an average daily dose of 0.8 mg. per gramme for four weeks; and three others died, presumably from chronic toxaemia, after an average daily dose of 0.75 mg. per gramme for the same length of time. In some of the animals that died and in one or two others that were killed the kidneys appeared to be congested, or to be rather large, pale, and oedematous, or to contain small haemorrhages; sometimes the pelvis was dilated, though no definite calculi were found.

Apart from actual death from toxaemia, many of the animals showed pareses, which recovered after the treatment was discontinued for two or three days. The animals treated for four to six weeks were mostly in poor condition, and put on only a quarter to half the weight of the corresponding control animals. Those that died late appeared emaciated. Considering that the control animals were found on post-mortem examination to be severely infected with Brucella, while the treated animals had nearly all freed themselves from infection, it is clear that the failure to grow normally was due to the toxicity of the drug rather than to the results of infection. In fact, the cure in this instance was worse than the disease.

Subcutaneous inoculation of soluble sulphapyridine proved very unsatisfactory. Owing presumably to the high alkalinity of this product—about *p*H 11—tissue necrosis rapidly occurred, leading not only to the formation of large local abscesses containing necrotic tissue but to dry gangrene of the corresponding extremities with sloughing of the toes. It seems desirable that this compound, if it is to be used, should be injected intravenously, as Marshall and Long (1939) recommend. As regards toxicity, one animal died of acute toxaemia on the fourth day of treatment after a total daily dosage of 0.55 mg. per gramme of body weight, suggesting that the soluble compound given subcutaneously is at least twice as toxic as the insoluble product given by the mouth.

A comparison of the results described in this paper with those previously reported (Wilson and Maier, 1939) shows very little difference between the therapeutic effect of sulphapyridine and sulphanilamide. In Experiment 2 with sulphanilamide, in which the animals were infected seven weeks before the beginning of treatment, sterilization of the tissues was reached after three to five weeks, using an average daily dose of 0.8 mg. per gramme of body weight. In the present Experiment 1 with sulphapyridine, in which the animals were infected six weeks before the beginning of treatment, sterilization of the tissues was nearly achieved in four weeks using an average daily dose of 0.7 mg. per gramme of body weight, and completely achieved in six weeks using an average daily dose of 0.65 mg. per gramme. As regards toxicity, however, the results were very different. None of the twelve animals treated with sulphanilamide died or showed any serious evidence of poisoning, while of the twenty-eight animals in the two experiments treated by oral administration of sulphapyridine two died of acute toxaemia, two of subacute toxaemia, and three of presumably chronic toxaemia.

In conclusion, attention may be drawn to the fact that in the animals treated with sulphapyridine the extent and severity of the macroscopic lesions in the tissues were very much less than in the controls. That this should be so with the animals in which treatment was begun a few days after infection is not surprising, but that it should occur when treatment was not started for six to seven weeks after infection is of some interest. At such a time the sublumbar glands are enlarged; the spleen is considerably enlarged, has an irregular surface, and frequently contains necrotic areas; and the liver often shows multiple tiny necrotic foci. The fact that these lesions completely disappeared in two out of six animals treated for three to five weeks with sulphanilamide, and in four out of ten animals treated for four to six weeks with sulphapyridine, shows how rapidly healing may occur and the tissues regain their normal appearance after the infecting organisms have once been destroyed.

Summary and Conclusions

1. Two experiments are recorded in which guinea-pigs infected with *Br. abortus* received treatment with sulphapyridine by the mouth or with soluble sulphapyridine subcutaneously, and were compared with untreated control animals.

2. The original dosage of 1 to 1.5 mg. per gramme of body weight of sulphapyridine by the mouth had to be reduced after three or four days on account of acute toxaemia in some of the animals. Even with a subsequent dosage of 0.6 to 0.8 mg. per gramme by the mouth a few deaths occurred from subacute or chronic toxaemia.

3. The original dosage of 0.55 to 0.7 mg. per gramme of the *soluble* product subcutaneously likewise had to be reduced on account of acute toxaemia. Later this substance was abandoned altogether on account of its production of extensive local tissue necrosis, followed by dry gangrene of the extremities, due apparently to the high alkalinity of the solution in which it was dispensed. It would seem desirable that this product, if it is to be used, should be given intravenously.

4. Though the extent and severity of the lesions in the internal organs, the number of colonies growing from the sublumbar glands and spleen, and the serum agglutinin titre were favourably affected by an average dose of 0.6 to 0.8 mg. per gramme, given *in two portions daily* for a fortnight, complete sterility of the tissues was achieved only after maintaining this dosage for four to six weeks.

5. Compared with the results previously reported using sulphanilamide, the animals treated with sulphapyridine by the mouth in approximately equal dosage behaved very much the same. So far as the therapeutic effect is concerned in guinea-pigs there seems little to choose between the two drugs. On the other hand, sulphapyridine appears to be rather more toxic for these animals.

6. In our previous paper we expressed the opinion that, since undulant fever in man is a self-limited disease with a very low case mortality, it is doubtful whether the ordinary patient should be exposed to the dangers accompanying intensive treatment with sulphanilamide. Considering that in the experiments reported in the present paper no fewer than seven out of twenty-eight animals receiving sulphapyridine by the mouth died of acute, subacute, or chronic toxaemia, it seems clear that the caution expressed in regard to the use of sulphanilamide for human patients is equally justified in regard to sulphapyridine.

7. Since both sulphanilamide and sulphapyridine have to be given for some weeks in a dosage bordering on the toxic limit if they are to bring about cure in guinea-pigs infected with Brucella, and since Colebrook (1939), among others, has drawn attention to the grave danger attending the use of these drugs for more than a few days at a time, it would seem wise to

reserve this type of therapy for cases of undulant fever that have resisted other forms of treatment.

We should like to express our thanks to Messrs. May and Baker, Ltd., for generously supplying the amount of M & B 693 required for our experiments.

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PLATELET-REDUCING EXTRACTS OF THE SPLEEN

BY

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When Troland and Lee (1938a, 1938b) reported the preparation from spleens removed from patients with thrombocytopenic purpura of an extract which reproduced the condition in animals hope was felt that we might be approaching an understanding of this very puzzling disease. It subsequently appeared that Torrioli and Puddu (1938) had been working on similar lines since 1933, and they issued a warning that the results were by no means so clear-cut or so specific as Troland and Lee had claimed. More recently Pohle and Meyer (1939) were unable to duplicate Troland and Lee's results in three cases of thrombocytopenic purpura. The rarity of the disease must be our excuse for reporting results in a single case.

A married woman aged 48 presented the classical features of thrombocytopenic purpura. She had had the disease for a year before coming to us, and we kept her under observation for a further three months, until menorrhagia made splenectomy essential. Her spleen showed the negative picture described in thrombocytopenic purpura, and her platelets, which we had never found above 45,000 per c.mm. before operation, rapidly rose to over 200,000. She promptly recovered from all her symptoms.

The spleen, which weighed 250 grammes, was extracted with acetone for seventeen days and, after removing the acetone and making the extract up to 100 c.cm. with distilled water, 5 c.cm. and 20 c.cm. respectively were injected intravenously into two rabbits. Little effect was produced by 5 c.cm., but after 20 c.cm. there was a sharp fall in the number of platelets. We then injected another 45 c.cm. into the first rabbit, and the platelets fell in thirty hours from 525,000 to 109,000 per c.mm.; they had returned to normal by the fifth day. This was, of course, a relatively enormous dose, corresponding to about 112 grammes of fresh spleen. No abnormal symptoms were noted.

Our first control was an acetone extract prepared in the same way from a spleen removed post mortem from a man aged 42 who died of a fractured skull. After intravenous injection into Rabbit No. 3 of 40 c.cm., corresponding to 44 grammes of fresh spleen, the platelets fell

Acetone Extract of Thrombocytopenic Spleen

Hours	Platelets per c.mm.	
	Rabbit No. 1 (Wt. 2.62 kg.)	Rabbit No. 2. (Wt 2.71 kg.)
Before Injection		
66	424,000	553,000
48	462,000	525,000
40	398,000	486,000
24	476,000	501,000
1	484,000	576,000
After Injection	Inject 5 c.cm. I.V.	Inject 20 c.cm. I.V.
1	472,000	368,000
4	408,000	405,000
22	406,000	442,000
24	476,000	471,000
30	495,000	482,000
46	549,000	572,000
70	526,000	
94	525,000	
After Injection	Inject 45 c.cm. I.V.	
1	329,000	
3	321,000	
6	386,000	
22	167,000	
24	130,000	
30	109,000	
48	164,000	
54	214,000	
70	270,000	
72	400,000	
77	391,000	
96	390,000	
120	568,000	

Acetone Extract of Normal Spleen (Rabbit No. 3, Weight, 2.52 kg.)

Hours	Platelets per c.mm.	Hours	Platelets per c.mm.
Before Injection		After Injection	Inject 40 c.cm. I.V.
24	400,000	2	306,000
18	447,000	5	385,000
2	454,000	22	460,000

Ringer's Extract of Normal Spleen

Hours	Platelets per c.mm.	
	Rabbit No. 4. (Wt. 2.55 kg.)	Rabbit No. 5. (Wt. 2.34 kg.)
Before Injection		
42	230,000	422,000
25	254,000	421,000
19	283,000	433,000
1	219,000	351,000
After Injection	Inject 5 c.cm. I.V.	Inject 20 c.cm. I.V.
3	211,000	300,000
7	217,000	246,000
22	231,000	329,000
24	187,000	267,000
30	270,000	315,000
48	256,000	400,000

in two hours from 454,000 to 306,000 per c.mm., but were back to normal within twenty-four hours. As the choice of acetone by Troland and Lee appeared to be purely arbitrary we then tried the effect of an extract made by emulsification of normal spleen in Ringer's solution in the cold for twenty-four hours and subsequent centrifuging. This spleen was obtained post mortem from a child aged 3 who died from cerebellar decompression. Of this extract 5 c.cm. had no obvious effect, but 20 c.cm., corresponding to 10 grammes of fresh spleen, reduced the platelets appreciably.

Summary

The acetone extract of a thrombocytopenic spleen reduced the platelets of a rabbit more powerfully than an acetone extract of a normal spleen. A Ringer extract of normal spleen was more effective in reducing platelets than the acetone extract of normal spleen, and it appears desirable to determine the optimum conditions for extracting platelet-lowering substance from normal spleen before comparing the conditions in health and disease.

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TREATMENT OF INFECTED BURNS

BY

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The literature on the treatment of burns is legion. A great number of publications followed the introduction of the use of tannic acid by E. C. Davidson of the Henry Ford Hospital, Detroit, in 1925, which has revolutionized this branch of surgery. Many writers since have published modifications of the original technique described, with reports showing excellent results. It is therefore with some trepidation that I venture to add to a subject so extensively investigated. The tremendous increase of burns in war-time surgery may, however, render this short article of interest now, and the somewhat rare opportunity of treating and watching the progress of eighteen cases of severe burns from one of His Majesty's ships seems worth recording.

The Use of Tannic Acid

The functions of tannic acid are twofold. First, in the early stages it prevents the absorption of toxins by combining with proteins and their metabolites to form a coagulum; and, secondly, the coagulum formed exercises a protective action. Suffering and shock are prevented by the protection of exposed nerve endings, but equally important is the effect of the coagulum in rendering the surface free from outside disturbance and guiding the growth of the new epithelium.

For practical purposes a burn may be considered like any flesh wound, healing proceeding most rapidly in the absence of bacterial infection. Such conditions are of course ideal for tannic acid treatment, the burnt area being rendered aseptic by cleaning before the tannic acid is applied. In war time the difficulties of thoroughly cleansing burns are many, and delay must often occur. Severe shock may contraindicate anaesthesia or any active treatment; transport difficulties are bound to delay the arrival of cases at the theatre. Consequently, though they may have received preliminary treatment, many burns met with under war-time conditions must be of the septic variety, and it is with such cases that this article is concerned.

Tannic Acid in Septic Cases

Burns which have been left for forty-eight hours or more may be considered septic, as no amount of treatment with ether or spirit will render them surgically clean. Difference of opinion exists as to the use of tannic acid in septic cases. Some surgeons prefer picric acid dressings unless the burn has been cleaned within forty-eight hours. Hamilton Bailey (1938) states that tannic acid treatment may be instituted as late as seventy-two hours. The cases reviewed here may help to support the contention that there is no time limit after which tannic acid treatment should be abandoned, and that good results may be obtained by its use where sepsis is fully established.

When applied to a septic surface tannic acid will form a coagulum more readily than on a surgically clean area. A crust soon dries which, if it stays in place and can be kept hard, will supply the rest and protection essential for the healing of the inflamed tissues beneath. Such treatment may be compared with that adopted by Winnett Orr for open fractures and by Dr. J. Trueta for infected wounds in Spain. The essential advantages of this method are that the surface remains undisturbed, the covering allowing epithelium to grow in from the edges, at the same time preventing the formation of fibrous tissue and piled-up granulations, which are nearly always seen when infected burns have been treated by constantly changed dressings. The speed of epithelization with such treatment is infinitely greater than when the surface is disturbed daily, and the saving of pain and discomfort to the patient beyond estimation.

Pus Formation

Pus will usually collect beneath the crust and may form in patches, or almost the whole crust may be slightly raised and fluctuation may be present. The usual teaching of removal of or incision into the coagulum under such circumstances was not adopted in these cases. If an expectant attitude is taken, within twelve hours the pus will always find its way out at some point. It may come through cracks in the coagulum, especially at joint flexures, or may ooze out at the edges. After discharging for a short time suppuration will cease, and any part of the crust which has become softened may be resprayed with tannic acid and dried. Not unnaturally the smell during the suppurative phase is somewhat unpleasant, but it is not nearly so bad as that encountered in the closed treatment of infected fractures.

Fever and Pain

Nearly all cases register a rise in temperature during this treatment. It may reach as high as 104°, but this should not cause undue anxiety, and should not be considered an indication for removal of the coagulum. In most cases the fever subsides in from two to three days.

The absence of pain during tannic acid treatment is well known to be remarkable, and the same fact applies when it is used for septic burns. Following the first application and drying little pain is experienced. A feeling of tenseness and heat sometimes exists for a few hours during the suppurative phase, before the pus has

found its way through the coagulum, but this is soon relieved. The agonizing pain, for which anaesthesia may be necessary, when infected burns are treated by daily dressings is thus avoided, and the general condition of the patient will benefit accordingly.

Use of Antiseptics

When sepsis is established the use of antiseptics in combination with the tannic acid therapy cannot render the area aseptic. Any strong antiseptic is in fact contra-indicated, as it may produce further tissue damage and prevent healing. Weak solutions of dye substances may, however, be used with the object of preventing undue bacterial growth. For these cases the tannic acid was made up in flavine solution and used in conjunction with a weak solution of methylene-blue and brilliant-green. Healing was very rapid, and it is possible that these dyes also help by stimulating epithelial growth.

The danger of softening the coagulum by using a watery solution and setting free toxins, which is very real in some early cases, is not great where sepsis is present at the beginning of treatment. If, however, the electric drier is used after each application of the dye solution softening need not be anticipated.

Description of Cases

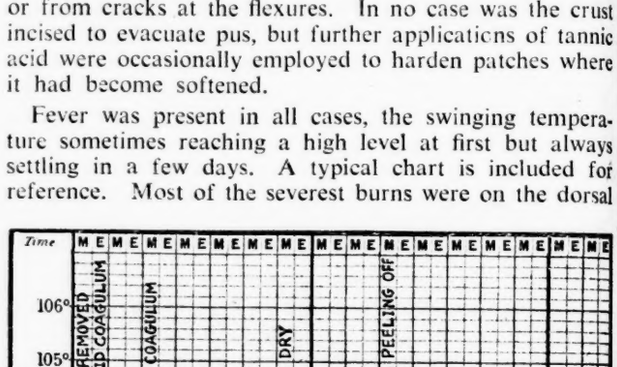
Eighteen cases of severe burns from cordite explosions were treated in this series. All these patients were healthy men of ages varying between 18 and 40 years. In nearly all cases the hands and face were burnt. In order of severity the sites involved were: (1) dorsal surfaces of hands and forearm, (2) feet and legs, (3) face, (4) back and neck.

The degree of the burns is difficult to tabulate, as it varied in different cases and at different sites, but it may be stated that most of the men had a considerable area of second-degree burning. A fact that may be of some significance is that all had been immersed in a mixture of salt water and oil for periods varying from a half to one and a half hours. These cases were received in hospital 120 hours later after preliminary treatment in one of H.M. hospital ships. This treatment consisted of tannic acid and flavine dressings without previous cleansing under anaesthesia, which procedure was no doubt contra-indicated by the condition of the men at that time.

On admission the general condition of the patients was fair, considering what they had been through, and the danger of primary shock and toxaemia had passed. Many of them, however, were in a shocked state owing to pain and lack of sleep, and at first frequent injections of morphine had to be given. When the dressings were removed the burnt areas almost without exception were found to be septic, patches of tannic crust and solidified discharge coming off with the gauze and leaving a raw infected surface which was extremely tender. The burnt limbs were now laid on sterile towels and swabbed over with a solution of 5 per cent. methylene-blue and 1 per cent. brilliant-green. They were next sprayed with a 20 per cent. solution of tannic acid in 1 in 1,000 acri-flavine, and the area dried with an electric hair-drier. No dressings of any sort were used. The tannic acid spraying and drying process was repeated three-hourly by day for the next forty-eight hours and the area occasionally dabbed with the dye mixture.

The crust which formed was sticky at first but soon became hard with the constant use of the drier. Great care was necessary at night to keep the burnt surface free from contact with bedclothes and towels, to which it would stick with consequent removal of the crust. The backs of the legs, the front of the wrists, the neck, and the back were troublesome in this respect, and these surfaces usually took longer than the average time to heal. The use of bed cradles and the slinging of limbs with bandages were found very helpful in avoiding this contact. A thick hard crust coloured blue by the dye was successfully formed on most surfaces. In the majority of cases pus collected below the covering and dripped from its edges or from cracks at the flexures. In no case was the crust incised to evacuate pus, but further applications of tannic acid were occasionally employed to harden patches where it had become softened.

Fever was present in all cases, the swinging temperature sometimes reaching a high level at first but always settling in a few days. A typical chart is included for reference. Most of the severest burns were on the dorsal


Time
M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E
DRESSINGS REMOVED TANNIC ACID COAGULUM
PUS UNDER COAGULUM
COAGULUM DRY
COAGULUM PEELING OFF
Temperature (Fahrenheit)
106°
105°
104°
103°
102°
101°
100°
99°
Normal Temperature of body
98°
97°
Day of Dis
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Pulse
90 80 76 76 92 84 80 84 88 80 88 80 80 92 90 74 84 80 80 82

Typical chart of a case of septic burns treated with tannic acid and dye.

surface of the hand and fingers. Daily movement of the fingers was found sufficient to prevent them adhering to each other, as the usual practice of separating them with gauze was not adopted.

Healing

From periods of five days onwards the crust begins to peel or break off at the edges. As soon as sufficient crust had come off, active and passive flexion of the finger-joints was started. Special attention should be given to the metacarpo-phalangeal joint, over which the new epithelium is always rather tight.

The edge of the crust as it receded was treated with the dye mixture till only a small central area was left. The patients seemed sorely tempted to pick off the edges of the crust as healing took place, a procedure which sometimes resulted in reinfection and delay in the date of their discharge. The time of healing in infected cases is considerably reduced by this method of treatment. Evidence of pus and raised temperatures disappeared in an average of three days. In most cases only a small scab of crust remained in the centre of the burn after twenty-one days, and the patients were ready for discharge. When the surface is constantly disturbed by the application of dressings the healing time is greatly prolonged.

This point is well demonstrated in one case in which in the early stages of treatment additional dressings of flavine were used on the back of one hand. The crust was disturbed by removal of the gauze, and finally a Thiersch graft was necessitated by excessive granulations and delayed epithelization. Healing of this hand was not complete in five weeks from the beginning of treatment. It seems certain this would not have occurred had the surface been left to heal under the crust, as the other hand, which was just as badly burnt and which was not dressed with gauze, was fully healed, with almost full movements, in twenty-three days.

After the crust is off, the new skin, which is delicate and sometimes rather tender, is treated with sterile petroleum jelly daily. Passive stretching of the skin by flexion of the fingers was persisted with by the patients themselves until full movement was obtained. No form of splinting was used in any of these cases.

Results

Of the eighteen patients treated one died of bronchopneumonia. It seems surprising that others did not develop chest complications, in view of the period spent in the sea. With the exception of one case, mentioned above, in which a skin graft was necessary, the remaining sixteen cases were ready for discharge within twenty-one days.

All these men were severely burnt and the burnt areas were septic on admission. Full movements at all joints were present on discharge and there were no contractures. Absence of scarring of face and hands was remarkable, and almost the only evidence of their burns was the appearance of the finger-nails.

Conclusions

The treatment by tannic acid and dye therapy of eighteen cases of severe septic burns has been described.

Tannic acid treatment has not failed when sepsis is established. Pus formation is not an indication for removal of the coagulum, and incisions into it are seldom, if ever, necessary.

The speed of healing is greatly impeded if the coagulum softens and comes off and gauze dressings have to be used.

Satisfactory final results were obtained. Absence of scarring and contractures was noteworthy. In burns affecting the hands normal movements and function were obtained in sixteen out of eighteen cases.

REFERENCE

Bailey, Hamilton (1938). *Emergency Surgery*, John Wright and Sons, p. 681.

The report on the work of the London School of Hygiene and Tropical Medicine for the year 1938–9 states that in accordance with instructions received through the University of London the School suspended its normal activities on the declaration of war. The reports of the heads of the various departments had been prepared before the end of August, and it was decided that they should be published notwithstanding the changed circumstances. A record number of students attended the principal courses of instruction during the year under review. Whether it may be possible to begin again any teaching during the war is uncertain, but it is hoped to keep together a nucleus of the staff, if not in London then in accommodation that has been reserved for the School at Cambridge and elsewhere.

Clinical Memoranda

Idiopathic Thrombophlebitis

Idiopathic thrombophlebitis is a comparatively rare condition. According to Barker (1936) two types can be differentiated: (1) The recurrent form ("migrans"), with recurrence usually within one year, characterized by inflammation and thrombosis, frequently of superficial veins, particularly involving the veins of the leg, affecting predominantly males (88 per cent.), and occurring for no apparent reason. (2) The non-recurrent form, usually affecting obese people of both sexes and involving the larger veins of the lower limb. The aetiology is doubtful, but toxins have been suspected and association with influenzal epidemics has been mentioned (Owen, 1928). Two cases recently under my observation may merit recording on account of the infrequency of the condition.

The first case, that of a schoolgirl aged 14, otherwise in perfect health and not obese, presented the symptoms of acute afebrile thrombophlebitis on the superficial veins of the dorsum of the left hand. There was no history of injury to the affected hand or arm. Prominent cords were visible, hard and very tender on pressure, and the axillary lymph glands were palpable and tender. The blood count, sedimentation rate, and blood pressure were normal, and, apart from chronic tonsillitis, no other abnormal condition was present. In the further course of the illness tenderness appeared over some of the superficial veins of the forearm, elbow, and upper arm. No definite evidence of thrombosis could be seen except in the veins of the dorsum of the hand, although some indurated veins could be felt in the forearm. Very marked chilblains developed on the fingers of the affected hand. After six weeks' duration the symptoms (aching pain in the arm) gradually subsided. The patient was attending school all the time. Treatment was confined to bandaging.

The second case, that of a girl aged 19, presented the same symptoms on the right arm, with tender and hard cords extending up to the elbow, and some swelling of the axillary lymph glands of the affected side. Again there was no record of injury. The history of this patient showed that she had had a similar attack about ten years ago, but not since. The blood count was normal. No septic foci could be detected. Her general health was excellent. The course of the illness was essentially the same as in the first case. The condition gradually subsided after six weeks. The patient was not confined to bed. Both cases came under observation during the last influenza epidemic.

The cases are interesting as they show the following features. The age is lower than that observed in the large series described by Barker. The cases do not readily follow Barker's division into recurrent and non-recurrent thrombophlebitis. The recurrence in the second case was very much later than the recurrence usually observed in these cases, and both cases occurred in female patients of younger age than that described by Barker. But they differ, too, from the non-recurrent group inasmuch as the localization of the thrombus was not in the large veins of the leg and the patients were healthy in every other respect. The aetiology remains doubtful, although one case presented a definite history of focal infection (tonsils). The coincidence of this affection with a widespread influenza epidemic may be of aetiological importance in view of Owen's observations.

London, W. P. F. MEYER.

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Barker, Nelson W. (1936). *Arch. intern. Med.*, **58**, 147.
Owen, A. W. (1928). *British Medical Journal*, **1**, 690.

Reviews

THE LOUSE

The Louse. An Account of the Lice which Infest Man: Their Medical Importance and Control. By Patrick A. Buxton, M.A., M.R.C.S., L.R.C.P., D.T.M. and H. (Pp. 116. 7s. 6d. net.) London: Edward Arnold and Co. 1939.

This little monograph appears most opportunely. Not only are our soldiers exposed to similar risks of infestation as were the troops in 1914–18, but the experiences of evacuation have shown that the incidence of this unpleasant insect is much higher than most people believed. Professor Buxton emphasizes that the proper understanding of the epidemiology and control of the louse is only possible when the details of its biology and life history are fully understood, and he has wisely planned the book on these lines. After a detailed chapter on the anatomy and biology of *Pediculus* the medical importance of the parasite is disclosed, and this chapter is enhanced by a consideration of the *Rickettsia* and the group of typhus fevers and of the types of relapsing fever. These three chapters review all the important investigations on the subject and are strengthened by much original work by the author, especially on collective biology.

A large number of methods have been used at different times and places to destroy lice and their eggs. The more efficient of these are given, with measures for the general control of infestation, disinfestation of clothes, and so on. The author urges the need for more comparative studies on the efficacy of the different methods. He suggests that attention should be paid to vegetable insecticides, especially Derris (there are, however, a number of records of toxic symptoms arising in man through contact with this substance). There is a chapter on the crab louse, which is a less important parasite, since it is not yet incriminated as a vector of disease and its incidence is much less than that of *Pediculus*. An appendix on methods of rearing and feeding lice gives adequate instructions for those who might be stimulated to further research on this important if unsavoury subject.

This monograph can be recommended to all those interested in public health or in the general biology of insects.

RECTAL SURGERY

Rectal Surgery: A Practical Guide to the Modern Surgical Treatment of Rectal Diseases. By W. Ernest Miles, F.R.C.S., F.R.C.S.I. (Hon.), F.A.C.S. (Hon.). (Pp. 359; 105 figures; 2 coloured plates. 17s. 6d. net.) London: Cassell and Co. 1939.

The author very modestly claims in his preface that this volume is "nothing more than a record of his personal interpretation of the various problems presented to him by rectal disease, and of the methods of treatment which experience has proved to be most efficacious." The commanding position that Mr. Miles has created for himself in the domain of rectal surgery is fully explained by perusal of this book, for nowhere else will the student or practitioner of proctology find such clear, such comprehensive, and such helpful guidance in the diagnosis, treatment, and above all in the post-operative treatment of common rectal disorders.

Two sections of the book stand out like peaks in a mountain range of merit and sound sense. In one of them the difficult and complicated subject of ano-rectal fistula in all its manifold varieties is reduced to an almost mathematical simplicity. At long last, too, the age-old controversy as to the danger of rectal incontinence following upon laying open the track of a fistula with a high-lying internal opening would appear to be solved, and safe and simple rules are laid down by the author for dealing with these difficult cases.

As might be expected, the other outstanding section of the book is the one dealing with the radical abdomino-perineal operation for rectal carcinoma which was evolved by the author many years ago upon anatomical and pathological observations so sound that they have never been controverted; and Ernest Miles is now universally acknowledged as the supreme master in this bold and radical type of operation. So bold was it that a mortality so heavy had to be faced in the earlier years that many surgeons of less determined character were constrained to fall back on more safe but less radical procedures. However, recent improvements in anaesthesia, the more ready recognition and exclusion of bad surgical risks by the routine employment of the Moot-McKesson cardiac energy index, and, above all, the routine post-operative use of continuous blood-drip and copious intravenous glucose saline, have now reduced the mortality to the neighbourhood of 10 per cent. It will be agreed that this is not an excessive price to pay for the very greatly enhanced freedom from recurrence conferred by Miles's operation.

This is, of course, a very personal book with strongly held views strongly expressed, and to the surgeon all the more valuable for this reason. The great clinical knowledge, the scrupulous accuracy of observation, and the careful consideration of every detail of pre- and post-operative treatment which are apparent in every chapter render it a mine of information in which anyone in doubt or difficulty about a rectal problem will find that sort of help for which one looks in so many textbooks in vain.

OXIDATION IN THE BODY

Biological Oxidations. By Carl Oppenheimer, M.D., Ph.D., and Kurt G. Stern, Ph.D. (Pp. 317; 17 figures. Cloth, 15 florins.) The Hague: Dr. W. Junk. 1939.

The human body contains a supply of oxygen which is only adequate for a few minutes' usage, and perishes in a correspondingly rapid time if the supply from outside is cut off. Hence the means whereby the body makes use of oxygen is a problem of fundamental interest to medical science. An excellent review in English of current ideas on this subject is now provided by Dr. K. G. Stern, who has translated and amplified a portion of Oppenheimer's large work on ferments and their action under the title *Biological Oxidations*.

The chief biological use of oxygen is to oxidize carbohydrates, and since the burning of a piece of sugar is a very simple process it might be imagined that the oxygen usage inside the body would be of a comparable degree of simplicity. If, however, we remember that the body has to carry out oxidations without causing changes in temperature, hydrogen-ion concentration, osmotic pressure, etc., then we shall not be surprised that, owing to these severe limitations, the process is in fact extremely complex. The general trend of research in recent years has, indeed, been to reveal an ever-increasing complexity in the mechanisms involved. A few years ago there were two rival and apparently incompatible hypotheses. Warburg had shown the existence in cells of iron-containing

enzymes that activated oxygen, whereas Wieland had shown that an important stage in oxidation processes was the removal of hydrogen. It is now recognized that the intake of oxygen by a living cell requires not one enzyme but a series of enzymes, which are believed to be arranged as follows: Donor of hydrogen —→ dehydrogenases as acceptors —→ cytochrome I —→ cytochrome II —→ cytochrome III —→ haemin ferment of respiration —→ oxygen. This complex scheme reconciles the two hypotheses, which previously appeared to be incompatible.

The problem is further complicated by the existence in cells of alternate paths of oxygen intake. One of the most important of these involves Warburg's yellow oxidation ferment, which is a combination of the phosphoric acid ester of lactoflavin (vitamin B_2) with a protein carrier. Although this latter appears to be a subsidiary mechanism, yet it is essential for the normal life of the cell, and owing to the accident that most mammals cannot construct lactoflavin it has been recognized as a necessary accessory food factor. Another vitamin—ascorbic acid—was believed a few years ago to be concerned in cell respiration, but its function is now uncertain. It is interesting to note that ascorbic acid is a necessary vitamin for some mammals, while in others, which manufacture the substance, it may be regarded as a hormone.

In general this review of the fundamental processes of cell life provides a picture of complex processes worked by chains of enzymes, some of which, owing to accidents of history, have been termed vitamins or hormones.

ATLAS FOR X-RAY THERAPY

A Topographic Atlas for X-ray Therapy. By Ira I. Kaplan, B.S., M.D., and Sidney Rubenfeld, B.S., M.D. (Pp. 120; 55 full-page plates. 4 dollars, post free; 20s.) Chicago: Year Book Publishers Inc. May be obtained from Messrs. H. K. Lewis and Co., 136, Gower Street, London, W.C.1.

Drs. I. I. Kaplan and Sidney Rubenfeld have produced in *A Topographic Atlas for X-ray Therapy* a beautifully illustrated atlas of surface anatomy, in which are indicated fields for *x*-ray therapy of various organs. While the format of the book is admirable, its usefulness is somewhat doubtful. The text is a mixture of extremely elementary anatomy, such as might be taught to a probationer, and brief instructions for radiotherapeutic positioning. As it is the latter which is apparently the *raison d'être* of this book the criticism is justified that the instructions laid down are too elementary for the medical man who presumably is to plan the exposures and set-up of each case. Again, the fields used by the authors are not necessarily those adopted by other radiotherapists. It may be that the authors have designed the book to enable lay technicians to carry out these procedures—a practice which is generally frowned upon in this country. If so, the atlas would be of some value.

CONGENITAL HEART DISEASE

Congenital Heart Disease. By J. W. Brown, M.D., M.R.C.P. (Pp. 237. 21s. net.) London: John Bale Medical Publications, Ltd. 1939.

The opinion is sometimes expressed that the detailed diagnosis of congenital heart disease is a matter for the post-mortem room. This erroneous view should be corrected by Dr. J. W. Brown's welcome book. It is true that an exact diagnosis of the structural defects may at times be impossible in spite of the use of all modern methods, but this applies also to other forms of cardiovascular disease. There is no doubt that a considerable proportion of cases of congenital heart disease remain undiagnosed; for, as the author remarks, a popular misconception is that its manifestations are limited to underdevelopment and cyanosis, whereas in fact the majority of cases do not show cyanosis. Neither the cardiologist nor the paediatrician as a rule has the opportunity of collecting more than a relatively small series of these cases, but Dr. Brown has been fortunate in having been able to observe over 350 in the course of eight years. Since congenital heart disease is very largely a matter of abnormal development, it can obviously be understood only through a knowledge of embryology, and this aspect is dealt with briefly but clearly in an initial chapter and in appropriate places throughout the book.

The classification formulated by Maud Abbott, whose authority on this subject is pre-eminent, is followed, but the alternative classification of Dry, which rests more on an embryological basis and less on clinical and structural features, is mentioned. The concluding chapters deal with infective endocarditis in congenital heart disease, special methods of investigation, diagnosis, prognosis, and treatment. The bibliography is adequate, though not exhaustive, and it must be admitted that the literature on this subject is widely scattered and difficult to collect.

Dr. Brown's well-produced book fills a gap in English literature on cardiology, and should assist both the more ready recognition and the more precise diagnosis of this form of cardiac lesion.

ENDOCRINOLOGY

Endocrinology in Modern Practice. By William Wolf, M.D., M.S., Ph.D. Second edition, completely revised. (Pp. 1,077; 176 figures; 14 tables; 4 plates. 45s. net.) London: W. B. Saunders. 1939.

That Dr. William Wolf's book has passed into its second edition so speedily is evidence that it has been found really helpful. In our review of the first edition in 1937 we called attention to its special features, and it will now suffice to indicate the principal additions and alterations. The changes in the treatment of diabetes consequent on the discovery of zinc protamine insulin are detailed, and attention is called to the value of endometrial suction biopsies, by which simple procedure time-consuming and expensive hormone extractions from the blood and urine can often be avoided. A section has also been added which deals with the intimate relation between the autonomic nervous system and the endocrine glands, though perhaps the line of demarcation between vagotonia and sympatheticotonia is drawn too hard and fast for present-day beliefs.

We observe that in the section on Cushing's syndrome a rather less dogmatic note on its aetiology is struck than in the first edition, which is appropriate in view of some of the newer work, but we regret to see that Dr. Wolf still thinks that anti-hormones and chalones are the same thing, which they certainly are not. Sharpey-Schäfer introduced the latter term for a hormone which exerts a relaxing or inhibitory action; Collip uses the term "anti-hormone" for a substance produced in answer to the administration of a hormone. We can assure Dr. Wolf that if he refers to Sharpey-Schäfer's original papers on the subject he will find that this is so, as we stated in our review of the previous edition; it seems a pity to perpetuate an obvious error. Nevertheless this book is packed with very useful information.

Notes on Books

First Aid for the Householder, by DRS. H. A. CLEGG and I HARVEY FLACK, is published by George Newnes, Ltd., at 1s. 6d. This little book should prove of practical value to many householders who, in these days, feel it a duty to learn something of first aid and the treatment of emergencies, and especially to those who have neither time nor inclination to attend a regular course of lectures with a view to examination. Since the examination question does not arise the authors have been able to cover a wider ground in a more practical and simple manner, and a good deal of unnecessary detail, which is so often a feature of this type of book, is well omitted. The body and its functions are treated more as a whole and less as a collection of separate systems, and such difficult subjects as the treatment of different kinds of insensibility and shock are described in a less confusing style than is usual in these handbooks. It would be easy to criticize any book of this kind on the grounds of omission or inclusion of detail. How much to include and what to leave out is a matter of personal opinion. Most of those who have to lecture to first-aid classes will regret the time spent in teaching a class the digital compression of main arteries and the use of the tourniquet. This instruction, necessitated by the prospect of examination, probably does more harm than good. The attention of the pupil is apt to be diverted from the supreme necessity of pressure on the bleeding point. In a book of this kind in particular, where the reader is not expected to have expert instruction, it might well be omitted. On the whole this little book achieves its object well.

Whitaker's Almanack for 1940 is published in three editions: library edition, leather binding with coloured maps, 12s. 6d.; complete edition, red and green cloth cover, 7s.; abridged edition, orange paper cover, 3s. 6d. The approach to war, the events following the invasion of Poland, and the consequent outbreak of hostilities are chronicled. The additional space is occupied partly by tables showing the productive capacity of the Allied and neutral nations and food imports from British and foreign sources, and partly by tables showing the times of rising and setting of the sun and moon throughout the British Isles. The index has again been increased and now occupies 264 columns. The new "Whitaker" also gives details of the emergency legislation which affects every type of business and every household.

Editions of *Clinical Diagnosis by Laboratory Methods*, by J. C. TODD and A. H. SANFORD, have appeared at almost regular intervals since 1908, and the publication of a ninth is evidence of its continued popularity. This work covers the whole field of clinical pathology, and in spite of its modest bulk furnishes full and very practical instructions for all methods ordinarily employed, embellished by many admirable illustrations. The principal changes in this edition are additions to the sections on clinical chemistry and on serodiagnostic tests for syphilis: the latter now occupies no fewer than 74 pages, a perhaps disproportionate but nevertheless useful feature. The book is published at 27s. 6d. by W. B. Saunders.

Nervous and Mental Diseases: Their Pastoral Treatment, by CHRYSOSTOMUS SCHULTE (London: Geo. E. J. Coldwell; 10s. 6d.), is a book by a Roman Catholic priest for the guidance of other priests in their confessional and pastoral duties when confronted with individuals suffering from nervous and mental troubles. Psycho-analysis is, as might be expected, anathema to the author, and hypnotism is not much less in disfavour. He is in no way antagonistic to the medical profession; in fact, he welcomes and insists on the need for their help, provided they do not influence their patients against the tenets of the Church. His main division of his patients is into those with too little inhibition and those with too much, and these groups obviously call for different pastoral treatment. Clinically he describes five groups based rather on the old French classification, which has fallen somewhat out of fashion in medical circles. The five groups referred to are: psychic compulsion, morbid depression phenomena (psychasthenia), morbid nervous strain and exhaustion (neurasthenia), hysteria, and abulia. To those interested in the vexed question of lay psychotherapy this book will be of interest; but in so far as it is intended to apply only to Catholic patients, who, the author appears to think, should be treated by Catholic doctors in conjunction with a priest trained in psychotherapeutic measures, it does not cover the whole ground. It seems possible that for such a patient it would be still better if his psychotherapist could have obtained both a medical and a theological training so as to avoid the need for dual control, and, in fact, this is done in some cases.

Preparations and Appliances

MOBILE UNITS FOR ELECTRICAL TREATMENT

A mobile unit for electrical treatment which will permit of a complete set of apparatus being transported to the bedside of a patient has been devised by Dr. C. B. HEALD, physician in charge of the Physical Medicine Department of the Royal Free Hospital, with the help of colleagues in that department and of Messrs. Stanley Cox Limited on the constructional side. The unit is enclosed in a cabinet in size and shape resembling a large bedroom wardrobe, but so trolleyed that it can be moved across the floor almost at the touch of a hand. The interior is a marvel of compactness, with shelves and trays so arranged as to facilitate expeditious withdrawal and handling of each separate apparatus.

The following is the equipment: a portable short-wave outfit with attachment for inductothermy (a means of giving diffuse treatment with short wave), two direct-current units, two "rotosurge" machines, an ultra-violet-light apparatus, an infra-red lamp, a radiant-heat lamp, a hot-air douche, and a paraffin wax outfit. The unfamiliar member of this octet is the "rotosurge" machine, but it is in fact an improved form of one of the oldest of electrical methods—the Bristow coil. To the original coil has been added a gramophone motor so that the current can be "surged" (increased and diminished) automatically and at a rate approximating to the heart-beat. Ordinarily the surging is left to the masseuse (who is thereby prevented from attending to other muscle groups) or even to the inefficient efforts of the patient himself, so that the automatic device offers a great improvement. Most of the benefits claimed for the sinusoidal apparatus can be obtained by a "rotosurge" machine, and therefore the sinusoidal has not been incorporated. Long-wave diathermy is another "absentee"; there is room for it in the cabinet if desired, but it is felt that the field is so well covered by short wave that the technical difficulties and slight risk of burns justified the exclusion of the other. Direct-current units are available for ionization if desired. The special recommendation of the mobile unit is the facility it offers for the transport to the bedside of a complete set of apparatus operating on the ordinary lighting circuit. Through the generosity of an anonymous donor five of these units (they cost £200 each) have been provided for the benefit of wounded and injured in the war, and the first of them has been in use for some weeks in Sector III of the London hospital region.

Dr. Heald has written an admirable booklet entitled *Mobile Units for Electrical Treatment: Their Utilization in Medicine and Surgery* (St. Clements Press), which is intended as a guide in non-technical language for resident medical officers, students, nurses, and medical auxiliaries to the physiological principles to be observed in prescribing treatment by electricity. Copies may be had from the author at 27, Park Crescent, W.

SCLEROSING SOLUTION

"Moramin" (Allen and Hanburys, Ltd.) is a sclerosing solution which contains 5 per cent. ethanolamine morrhuate. This compound is claimed to have all the advantages and none of the drawbacks of sodium morrhuate. It is stated to be harmless to the surrounding tissues in the event of leakage and to be painless when injected.

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DIET, OXYGEN WANT, AND HIGH FLYING

Some years ago J. Argyll Campbell[1] showed that in many conditions in which tetany eventually occurs the oxygen tension of the tissues is very much decreased before the onset of the tremors. As muscular contraction causes a marked increase of oxygen tension in the tissues, this, he suggested, was the purpose of the muscular contraction in tremors and convulsions. He then began to investigate the influence of diet and various substances on the resistance to oxygen want in rats, eventually developing the following technique[2] for his investigations. White rats about 80 grammes in weight are put into a decompression chamber in which the barometric pressure is gradually decreased to 240–250 mm. Hg within a period of five minutes. The oxygen pressure at this stage is 7 per cent. of one atmosphere—corresponding to an altitude of about 30,000 feet. If the temperature of the chamber is 20 to 25° C., and the rats have been fed on a normal diet, they survive at least thirty minutes, but if the temperature of the chamber is 33° C. the rats all die within about ten minutes. The first increase in the survival time of rats exposed to low pressure and high temperature was observed when they had been fed wholly on carrots for six days preceding the experiment. They then survived for thirty to sixty minutes. Other foods found to have a beneficial effect were beetroot (boiled to remove some apparently toxic substance), apples, and bananas.

The normal diet used in the earlier experiments had consisted of wheat, oats, peanuts, puppy biscuits, potatoes, maize, bread, kitchen scraps, peas, beans, and greenstuff. In order to investigate which part of the carrot was effective in increasing the resistance of the rats to oxygen want a synthetic basic diet was used. Substances found to have no beneficial effect on resistance to oxygen want were pure vitamin A, carotene, nicotinic acid, lactoflavin, cocaine, adenosine, ammonium chloride, and sulphanilamide.[2,3] Nor did a full diet of milk have any effect. On the other hand, by investigating various constituents of the carrot it was found that a diet with a low protein content or a high fibre content was decidedly beneficial. It was not merely the loss in weight that occurred (about 10 per cent.) on the whole-carrot diet, for starvation of rats to the same loss of weight did not increase their resistance to oxygen want. If the protein of the diet consisted of casein or meat it had to be cut down to 5 per cent. before any beneficial effect could be detected, but gelatin given in much larger amounts and zein in amounts as high as 50 per cent. of the diet raised the survival time of the rats. Glutamine, tryptophane, tyrosine, and lysine were found to have some effect. Charcoal or kaolin as 25 per cent. and agar as 10 per cent. of the diet were found to give protection equal to cellulose as 25 per cent. of the diet.[4] This may adsorb some toxic substance from food residues in the intestine—residues probably from the protein and not from fat or carbohydrate, since the amounts of these two in the diet can be varied 25 to 35 per cent. without affecting the result. There is probably some other substance present in carrots and not yet identified which is helpful in raising the resistance of rats to oxygen want.

How far can these important animal experiments be applied in choosing a suitable diet for the personnel of the Air Force, for whom resistance to oxygen deficiency is a vital question? In a presidential address to the United Services Section, Royal Society of Medicine, Air Commodore Whittingham,[5] referring to the diet of persons on long-distance flights, chosen largely on the basis of trial and error, said that a diet consisting mainly of carbohydrate had been found to be the most suitable, as muscular movements and exercise during flight are very limited and the chief need is to maintain bodily heat and energy. In fact, as the flight progresses, especially in warm climates, it is found that the appetite is materially decreased. A suitable flying ration for a three-days flight contains dried meat sandwiches, chocolate, oranges, apples, bananas, dried dates, dried figs, dried raisins, sugar, chewing gum, coffee, and malted milk tablets. The protein content appears to be about 15 per cent. of the total dry weight and the fat only 10 per cent., while the carbohydrate constitutes the main portion of the diet—namely, about 75 per cent. It seems, then, that in actual practice a carbohydrate diet is the most suitable for these long-distance flights. An interesting point is whether a similar diet is also the most suitable for sudden exposure to high altitude. Argyll Campbell's animal experiments suggest that this is the case. In his latest communication[6] he states that "suitable articles of diet for subjects exposed to the effects of oxygen want due either to disease or to high altitude are zein (but not whole maize), carrots, parsnips, beetroot, apples, bananas, starch, glucose, fat (lard), vitamins, and salt. Gelatin and gluten (flour) might be used also in very moderate quantity and milk in small quantity." The conclusion is that a diet for airmen should be mainly carbohydrate in nature and include also apples, bananas, carrots, parsnips, and beetroot to provide the

[1] *Lancet*, 1926, **1**, 72.
[2] *J. Physiol.*, 1938, **93**, 31P.
[3] Ibid., 1939, **95**, 1P.
[4] *J. Physiol.*, 1939, **95**, 28P.
[5] *J. roy. Naval med. Service*, 1939, **25**, 317.
[6] *Quart. J. exp. Physiol.*, 1939, **29**, 259.

fibre. Gas formation and ballooning of the intestine are not apparent in animals on this diet. Air Commodore Whittingham points out that the present precaution against anoxia is to supply an increased percentage of oxygen in the inspired air for flights at heights between 16,000 and 35,000 feet. It might be argued, therefore, that special diets to counteract oxygen want are not necessary. The evidence given above for the long-distance flights does not support this. The best results will be obtained when due care is directed to, among other things, administration of both diet and oxygen. Moreover, it must be remembered that the oxygen supply may fail, and the airman with the best resistance to anoxia has the best chance of coming through safely; it seems clear from animal experiments that such resistance may be definitely increased by suitably chosen food.

EXPERIMENTAL MAMMARY CANCER

In a recent review Bittner[1] advances the hypothesis that mammary cancer in mice results from the co-operation of genetic, hormone, and milk factors. Genetic uniformity within strains of mice has been attained by close inbreeding through many generations. Mammary cancer develops in almost 100 per cent. of the adult females of some strains, not at all, during long periods of observation, in some, and with intermediate frequency in others. The susceptibility to mammary cancer is certainly inherited, but a susceptible mouse does not inevitably develop cancer. Moreover, the proportion of cancerous mice in an inbred strain is not constant under all conditions. Gross variations are recorded at different times or in different laboratories; some are attributable to conditions of nutrition or reproduction, but others are unexplained. In certain strains virgin mice are rarely afflicted, but normal reproduction results in a manifold increase of mammary cancer; in other strains the incidence is low in females which breed normally but is increased in those which are caused to breed rapidly without the opportunity of nursing their young. The influence of reproduction is attributed to a hormone factor whose potency is established by the experiments of Lacassagne and others, showing that large doses of oestrogens evoke mammary cancer in male as well as in female mice of susceptible strains. Bittner described another contributory cause of mammary cancer—a factor transmitted in the milk. The recognized importance of Bittner's observations warrants an analysis of the basic facts.

Two inbred strains of mice and their hybrids serve for illustration. About 80 per cent. of the breeding females of Stock A (Strong's) develop mammary cancer; in Stock B (Little's C_{57}) the incidence is 1 per cent. or less. The AB hybrids from A mothers and B fathers have the same genetic constitution as BA hybrids from B mothers and A fathers, but mammary cancer develops in 95 per cent. of AB hybrids and in only 8 per cent. of BA hybrids. Bittner ascribes this departure from Mendelian laws to the decisive action of a factor or influence transmitted in the mother's milk. When A mice were removed from their mothers soon after birth and nursed by B foster-mothers the incidence of mammary cancer fell from 80 per cent. to 7 per cent. The incidence in AB hybrids transferred to B foster-mothers likewise fell from 95 per cent. to *nil*; conversely it rose in BA hybrids transferred to A foster-mothers from 8 per cent. to 93 per cent. In Andervont and Eleney's[2] confirmatory experiments with another high-cancer strain the incidence of mammary cancer was reduced from almost 100 to 25 per cent. provided the mice were transferred to B foster-mothers within seventeen hours of birth, but the reduction was only to 63 per cent. if they remained with their mothers up to twenty-four hours. Whether or not a mouse will succumb to mammary cancer in its maturity is decided, apparently, by the milk it receives during the first day or two of its life.

Bittner's further observations on the offspring of the fostered mice are more complex than can be indicated in the brief appraisal which follows. Some of the mice which were nursed by low-cancer foster-mothers nevertheless developed mammary cancer; among their progeny mammary cancer was about as frequent as in the normal A stock. The progeny of the mice which were protected from mammary cancer by fostering had, on the contrary, a low incidence, and those which developed it did not transmit it to their descendants. The fostered mice probably differed only in the amount of milk factor received from their mothers. In one group the progeny were cancerous because the parents received and transmitted the milk factor and not because the parents were cancerous, for, in accordance with the genetic theory that selection within a pure line is ineffective, the offspring of cancerous and of non-cancerous mothers of the A stock develop cancer with about the same frequency. In the other group the fostered mice did not receive enough milk factor to evoke mammary cancer and did not transmit it to their progeny; the latter, apart from their low incidence of cancer, were normal A mice, and when nursed by foster-mothers of the A stock they developed mammary cancer with the frequency which characterizes the A stock. It seems that A mice can transmit the factor without developing cancer, but that A mice which have not received the factor in infancy cannot themselves elaborate it. If these deductions are valid it is improbable that the factor is a hormone; it may be a virus, or it may be an agent of another kind for which there is no label to hand; and with the facts available Bittner is justifiably cautious in calling it an "influence."

There is no evidence that a "milk factor" is concerned in cancers other than those of the breast; there is none in the inherited lung cancers of mice. On Bittner's view the milk factor is decisive in the production of mammary cancer only when essential genetic and hormone factors are also present. The three-factor hypothesis comprehends most of the facts

[1] *Publ. Hlth. Rep.*, Wash., 1939, **54**, 1590.

[2] *Publ. Hlth. Rep.*, Wash., 1939, **54**, 1597.

known about mammary cancer in mice. It is not certain, however, to what extent a deficiency in one factor can be countered by excess of another. The supply of milk factor by foster-nursing or of oestrogens by injection has failed to evoke mammary cancer in low-cancer strains in some experiments, but a considerable incidence of cancer has been reported in others. Bittner acknowledges, moreover, that the three-factor hypothesis does not apply to the mammary cancers which occur, rarely, in low-cancer strains and in the progeny of non-cancerous fostered mice. It is justifiable to ask if a hypothesis which applies to some but not all of the mammary cancers in mice applies to some or all or none of the mammary cancers in women. The answer must be incomplete. There is evidence of a familial factor in some and of an endocrine factor in some; a milk factor has not been sought hitherto and, if it exists, may for a long time elude demonstration. Meanwhile, Bittner's observations should be held in view. Extension of the experiments to other species of animal may encourage or, perhaps, discourage generalization of the ideas garnered from observation on mice. This extension has begun. Geschikter, using massive doses of oestrogens, produced mammary cancers in rats which were free from the spontaneous disease. More recently Greene[3] has recorded a series of mammary cancers in rabbits, animals not prone to mammary cancer. The many examples observed by Greene were all in rabbits with common ancestors; a familial factor was certainly operative, though a rigorous genetic analysis is not yet possible. A hormone factor, according to Greene, was also involved; the histological changes in the endocrine organs, especially the pituitary, were characteristic of excessive oestrogenic action. A milk factor was not detected, but undue weight should not be given to this observation. There was a regular sequence of changes in the breasts of the rabbits: sudden and intense engorgement was succeeded by cyst formation, benign neoplasia, and, if the rabbits survived long enough, carcinoma with metastasis. The changes preceding cancer are reported to resemble those found in Schimmelbusch's disease in women. Cheatle similarly compared Schimmelbusch's disease with the mammary changes induced in mice by administration of oestrogens. These histological comparisons should be made and applied with caution; so used, they are welcome indicators that the study of mammary cancer in rodents is not remote from the problems of medical practice.

THE SPAS IN WAR TIME

Some misgivings may well be raised by the letter published in another column, calling attention to the severe war-time restrictions now imposed upon the British spas. The abrupt commandeering of the chief hotels has made it very difficult for patients with independent means to obtain the treatment they need, and at the same time deprived the spa establishments of their chief clientele. We understand that this has already led in several instances to the partial closure of the baths and to the dispersal of the specially trained staffs. But what we must regard as an even greater disservice has been done by taking over the spa hospitals for casualties. For this has affected a much larger number of invalids—the insured or assisted industrial workers and their wives, who cannot afford hotels. The spa hospitals, large and small, have played an honourable part everywhere. In England this goes back for several hundred years. On the Continent many of them have the advantage of Government recognition or support. The work accomplished by them for many kinds of disablement is of a kind that is only possible where large numbers of similar cases can be brought together under institutional care. To take away the spa hospital from the spa would be almost to knock the keystone out of the arch. It is sometimes said abroad that the British attitude towards rheumatism is less scientific than that of the German and French schools. Certainly it would be a calamity to science if such opportunities for research were set aside. It would also be unfortunate if, from the loss of the hospitals, the spas were no longer available for treatment of sailors, soldiers, and airmen. In the last war the spas had a record of which they had reason to be proud. In the years 1914–22 it is stated that more than 50,000 war cases received spa treatment in this country.[1] The Royal Mineral Waters Hospital at Bath and the Devonshire Hospital at Buxton each accommodated about 5,300 men sent to them for hydrological treatment. Harrogate also received large numbers, Cheltenham and Droitwich each about 3,000, even Strathpeffer 589. In all localities the baths and waters were provided free of charge. Many new methods, for both local and general treatment of injuries and illness, were devised and made available at all the spas during these years. With this experience it is believed that the future service of the spas, if called upon, could be greatly developed, especially in the direction of better organization and differentiation of cases, with more precise methods and records. If need arises the spas should, with the facilities now at their disposal, become leading centres for the rehabilitation of injured men. We support the appeal made by our correspondents, and hope that the responsible authorities will see their way to releasing the spa hospitals and other necessary spa accommodation.

THE PULMONARY CIRCULATION

Dr. R. A. Young did well to choose the pulmonary circulation as the subject of his Harveian Oration, published in this and the last issue of the *Journal*. For despite its long historical background, so admirably described by Dr. Young, the pulmonary circulation still suffers from neglect: no doubt, in part, because it is the lesser circulation and is not so complicated, and therefore to some extent not so interesting, as its larger or systemic fellow. Nevertheless the pulmonary circulation has presented great difficulties to the investigator. Methods for the direct and indirect measurement of arterial, capillary, and venous pressures, for the recording of vascular changes by plethysmography, and for the direct microscopical examination of the vessels have overcome many of the strongholds of the greater circulation. But the very methods that have been so fruitful elsewhere cannot be applied, or are applied with difficulty, to the circulation in the lung, and it is rather lack of such methods than dearth of ideas which accounts for our ignorance. To take a simple example, the introduction of the indirect method of gauging arterial pressure in man has yielded important

[3] *J. exp. Med.*, 1939, **70**, 147, 159, 167

[1] *Archives of Medical Hydrology*, January, 1924.

data on the systemic arterial pressure and its variations in health and disease. Consequently much is now known about the disorders associated with systemic hypertension and hypotension, and their classification and aetiology. Similar information about pressure in the pulmonary circulation is not available. No indirect method has been devised, and the direct method of needling the pulmonary artery requires a vicarious fortitude which, unfortunately for science, though maybe fortunately for the patient, has not been forthcoming. It is clear that the pulmonary artery pressure is much lower than the systemic; the figures usually given, and chiefly from animal experiment, are 44 mm. Hg for systole and 12 mm. Hg for diastole; and the occurrence of right ventricular hypertrophy suggests that the pressure in the pulmonary artery is raised in certain diseases; but neither the existence nor the extent of pulmonary hypertension has ever been demonstrated by actual measurement. Many other unsolved problems of the pulmonary circulation may be cited, and one may be mentioned. In a healthy subject the amount of blood traversing the lungs is about five litres per minute during rest, but may rise to thirty litres during severe exercise. It may be presumed that this tremendous increase is effected by pulmonary vasodilatation, but we are still ignorant whether this dilatation is brought about passively by raised intravascular pressure or actively as a result of reflex nervous or hormonal influences. The figures given certainly show the pulmonary circulation to have immense reserves of capacity, and in this connexion it is rather surprising that such severe disturbances should result from the embolic occlusion of one branch of the pulmonary artery. One important clinical feature has its origin in the pulmonary circulation—namely, cardiac dyspnoea. The pioneer researches of Peabody[1] demonstrated the close relation between breathlessness in heart disease and diminished vital capacity of the lungs. Careful analysis has shown that this decrease in vital capacity is to be attributed to engorgement of the lungs with blood, the alveolar spaces being encroached upon and the lung tissue being rendered more rigid. Out of this work has grown the conception of left ventricular failure manifested chiefly by dyspnoea which is often paroxysmal. Although this conception is not universally accepted, it is in harmony with what clinical facts there are and is supported by experimental evidence.

VAGUS INNERVATION OF STOMACH AND DUODENUM

The effects of nerve stimulation or resection on the movements and secretion of the stomach have been studied experimentally for many years, both before and since Pavlov's gastric-pouch experiments of 1910. And for a long time it has been accepted that nervous factors are of importance in the causation of peptic ulcer in man, a view that has recently gained still further ground. The exact way, however, in which a state of mind might lead to ulceration of the stomach or duodenum still remains in doubt. In certain cases of intracranial lesions, notably those in the neighbourhood of the pituitary and hypothalamus, peptic ulceration may occur, and some connexion between parasympathetic stimulation and gastric or duodenal lesions seems frequent. Thus recent work has localized with some accuracy the centres of parasympathetic control to the anterior part of the hypothalamus in the floor of the third ventricle. Stimulation of this area in the brain causes in animals an increased flow of gastric juice and heightened gastric motility. These effects are produced by way of the vagus nerve. F. R. Edwards,[1] reviewing certain of these investigations, refers in some detail to the effects of vagus section in animals and discusses past results of this procedure in man. If the vagus is cut in animals so that all its branches to the stomach and pylorus are divided the stomach, he writes, dilates considerably during the course of a few weeks and the animal vomits frequently. At the same time a condition of cardiospasm is set up so that a mega-oesophagus gradually develops; the gastric enlargement is similarly the result of pylorospasm due to unopposed sympathetic action. If, however, the pyloric branch of the nerve is spared the animals remain healthy and the stomach appears to function normally in every way. In twelve cats upon which Edwards performed this operation the gastric secretion was also little changed. A similar pyloric spasm has been shown to arise in man if the vagus is cut above the branch to the pylorus, and in most cases a permanent reduction of gastric acid results. Thus Edwards records the work of Berg, Latarjet, and others, who have performed vagotomy in cases of hyperchlorhydria, tabes with gastric crises, and other conditions, and have reported a considerable reduction in gastric acidity. In many, however, an associated gastro-enterostomy was performed on account of the induced pyloric spasm. It is clearly a matter of interest in the experimental research upon the causation of peptic ulcer that the fullest knowledge of the neurogenic factors concerned should be available. It is at least suggestive that an apparent connexion between vagus activity, hypothalamus, higher centres, and gastric activity should be beginning to appear, and if further study should demonstrate the precise paths through which emotional factors influence gastric secretion and motility the means of preventing ulceration may perhaps become more defined. It may be, as Edwards hints, that even if this is not possible some procedure may be developed which will block the paths of stimuli running from the brain to the stomach, as, for instance, by section of the vagus nerve.

[1] *Harvey Lectures*, 1916-17. **12**, 248.

PREVENTION OF BLINDNESS

A great piece of work in the spread of the knowledge of the causes of blindness and the means of preventing this catastrophe was done by the former Prevention of Blindness Committee of the Union of Counties Associations of the Blind. When that committee was dissolved the work was taken over by a special committee of the Ministry of Health, which is continuing the analysis of the certificates of blindness prepared for the local authorities throughout the country. There has been some feeling that a voluntary committee, as apart from a Government committee, might serve a useful purpose in driving home the lessons of these statistical returns to masters of industry and local authorities. Accordingly the National Institute for the Blind, which has done so much and such valuable work for the blind, has appointed a prevention of blindness subcommittee. Its personnel is representative of all classes, lay and medical. Its chairman is Dr. C. G. Kay Sharp of Leeds. He commented upon the work of the new committee in his address at the conference of the Wales and Monmouthshire Regional Council of the Blind in Colwyn Bay. The National Institute for the Blind has done another good piece of work in preparing a report on blindness in India.[2] In a foreword Sir Michael O'Dwyer says

[1] *Lpool. med.-chir. J.*, 1939, **46**, 181.

[2] *Blindness in India.* National Institute for the Blind, 224, Great Portland Street, London, W.1.

there is no country in the world to-day where the affliction of blindness is so widespread as in India, nor where the ratio of blindness to population (350 millions) is so high. The totally blind are estimated at one and a half millions, the partially blind at three millions. Again, there is no civilized country in which so little is being done by the State, by public bodies, by voluntary associations (which hardly exist in India), and by private philanthropy to prevent blindness or to alleviate the lot of the blind. Among the reasons for the failure to tackle the problem are primarily the fatalism, common in the East, of regarding physical affliction as an act of God; the strength of the family and caste system, which, though producing many admirable results, limits the outlook and prevents the growth of a civic sense; the fact that nine-tenths of the population live in small and scattered villages or hamlets remote from the amenities of civilized life; and that only one-tenth are able to read and write. The report of the National Institute for the Blind includes an appeal to the Government of India. The International Association for the Prevention of Blindness has issued another number of its journal,[3] which is a model for international publications, for it prints its matter in parallel columns of French and English. This issue deals with the recent annual session in London, at which Dr. Park Lewis of the U.S.A. was awarded the gold medal of the association for his great work in America. There are reports on ophthalmia neonatorum in various countries; of particular interest are the notes from Dublin showing the excellent effect of prophylaxis. There are papers on eye diseases in workers by C. Coutela, and on lighting in schools by N. Bishop Harman. Of great interest is a note by H. Schröder on a small village called Titepec in Mexico, where all the inhabitants, indigenous and strangers, become blind. Investigations suggest that this blindness is caused by mosquitos which infect the people with a blinding worm of the genus Onchocerca.

RELATION OF PYELONEPHRITIS TO HYPERTENSION AND RENAL FAILURE

For many years infections of the urinary tract were regarded as of more interest to the urologist than to the physician. The term "pyelitis" carried with it the suggestion that the parenchyma of the kidney was not involved. More recently there has been a growing realization of the fact that this term is a misnomer and that urinary infections, whether arising through the blood stream, the lymphatics, or by ascending infection from the bladder, affect the kidney itself in practically every instance. With the modern treatment of these conditions have arisen a fresh interest in the subject and an appreciation of the fact that pyelonephritis—the more correct term—is a disease which may lead to renal failure and hypertension. Physicians especially interested in this branch of medicine have been on the look out for such cases, but most of these are still wrongly diagnosed as chronic nephritis. An important and readable review of pyelonephritis in its medical aspects by Weiss and Parker[4] has now appeared; this will do much to bring home the importance of the condition as a cause of serious illness. The natural history of pyelonephritis and some of the reasons for its seeming obscurity are thus summarized by these authors:

"As long as 'pyelitis' of early childhood was considered by paediatricians as a transient purulent infection of the renal pelvis it was not suspected that this condition in its chronic stage is related to certain types of toxaemia of pregnancy, observed by the obstetrician; to subsequent attacks of pyuria, treated by the urologic surgeon; and to arterial hypertension, developing years later and associated with impaired concentrating capacity of the kidney, cared for by the internist."

Weiss and Parker classify pyelonephritis into acute pyelonephritis (pyelitis), chronic pyelonephritis, healed pyelonephritis, and healed and recurrent pyelonephritis. Any of these may be unilateral. In acute pyelonephritis the inflammation is primarily interstitial; recovery is the usual result. Vascular changes in the veins and arterioles occasionally arise at this stage. In the chronic and healed cases vascular changes are often prominent; they consist of an increase of connective tissue in the intima of the arteries with some hypertrophy of the media. There may be concentric proliferation and even necrosis of the arterioles. In patients in whom hypertension has been present the vascular changes are diffuse and severe, though the pyelonephritis may be unilateral; but in the absence of hypertension there are no significant vascular changes except in the scars. These arteriolar lesions are often identical with those seen in malignant hypertension. They are not found in the tuberculous kidney unless pyelonephritis coexists. The authors also describe the general histological findings in these cases, and in particular how they are to be distinguished from those of chronic nephritis. There is usually variation in size of the kidneys, with scars of irregular distribution. There is evidence of inflammation of the pelvis and calices. Microscopically, in the scarred areas the tubules are filled with colloid casts. These indicate non-functioning nephrons and are pathognomonic of pyelonephritis. There is also marked infiltration of the intertubular tissue with lymphocytes and plasma cells, and pericapsular fibrosis affecting the glomeruli. Typical clinical histories show in some cases the development from recurrent attacks of pyelitis into a state of renal failure with hypertension ending in uraemia. Other patients, however, may develop uraemia without hypertension. In some the clinical picture is very like that of nephrosclerosis (malignant hypertension), and it is suggested that 15 to 20 per cent. of cases of malignant hypertension may be due to pyelonephritis. The authors point out that in these the vascular disease appears to be more localized and that, although retinitis occurs, cerebral and cardiac complications are rare. Pyelonephritis may arise in early infancy or childhood and lead to adolescent renal failure. It is thus one of the causes of renal dwarfism. In such patients the kidneys are often conspicuously small, and this, the authors suggest, is due not to developmental hypoplasia but to interference by the disease with the normal growth of the kidney. Chronic and healed pyelonephritis occurs more frequently than chronic glomerulonephritis; it is a disease of importance in obstetrics, paediatrics, internal medicine, and surgery, and is one renal disease which can be treated effectively in its incipient stage.

[3] *J. social Ophthalmol.* (66, Boulevard Saint-Michel, Paris, 6e).
[4] *Medicine*, 1939, **18**, 221.

We regret to announce the death of Dr. Alexander Dingwall-Fordyce, consulting physician to the Royal Liverpool Children's Hospital and formerly lecturer on diseases of children in the University of Liverpool.

Professor Bidhan Chunder Roy, M.D., F.R.C.S., of Calcutta, has been elected President of the Medical Council of India, in succession to Major-General E. W. C. Bradfield, I.M.S. Professor Roy is the first non-official president and the first Indian to hold the office.

SURGICAL PROCEDURES IN GENERAL PRACTICE

This is one of a series of articles contributed by invitation

AMPUTATION STUMPS AND ARTIFICIAL LIMBS

BY

P. JENNER VERRALL, F.R.C.S.

The war of 1914–18 added greatly to our experience of amputations, and even at that period many of the old textbook operations had become obsolete. In the last twenty years considerable further progress has been made: it has been shown that much of what was then done has not stood the test of time, and that many amputations, satisfactory enough in younger people, become impermanent as age advances and circulation becomes less adequate. Accordingly many changes of technique have been evolved, and fortunately these have coincided with a great improvement in the manufacture of artificial limbs, which are now made lighter and are simpler in mechanism. A man with a satisfactory below-knee amputation may expect to be able to walk five to ten miles in comfort, whereas he might well be unable to walk a hundred yards with a maimed leg. Where possible there should be co-operation between the surgeon and the limb-maker, the former aiming at the provision of an ideal stump and the latter being prepared to exercise his ingenuity in fitting one which is not so.

Emergency Amputations

Let us consider the duty of a surgeon confronted with a major limb injury in which part of the limb is irretrievably destroyed, say from a motor or an industrial accident. Unless it is absolutely certain that the intermuscular planes have not been infected and that the skin of the limb can be rendered aseptic, he should treat the case as a compound fracture, merely all dead or contaminated tissue being removed and the final stage left to a future date. In many cases it will be advisable to perform a "guillotine" amputation. This consists in dividing the limb in an absolutely circular manner, leaving as much as possible, tying vessels, and opening up no intermuscular planes. A non-adherent dressing is then applied. Suitable dressings are gauze soaked in flavine paraffin for the first two or three days, followed later by Dakin's oil sprayed on the wound. The latter has an agreeable odour and is highly antiseptic. The constituents of these two preparations are:

Flavine paraffin:

Acriflavine	gr. viij
Rectified spirit	℥ vj
Liquid paraffin	℥ xxxiv

Dakin's oil:

Dichloramine-T	2 parts
Chlorinated eucalyptol (Martindale) ...	20 parts
Chlorinated paraffin (Martindale) ...	80 parts

A large proportion of guillotine amputations remain permanently satisfactory if in the course of a few days traction be applied to the skin. Four pieces of adhesive strapping are attached at intervals round the stump, and by means of these extension is made to the end of an apparatus similar to a truncated Thomas splint. Healing will take place very rapidly and the resulting scar will contract to a surprising degree. Such a terminal scar is often quite satisfactory in the arm, forearm, thigh, and rarely, though occasionally, in the leg.

Should reamputation be necessary no attempt at the creation of a permanent stump should be made until the wound is covered with healthy granulations and there is no oedema in the stump. At the time of reamputation the granulations should be well painted over with pure carbolic, and no instruments, swabs, etc., allowed to come in contact with the open wound. Where amputation is performed for disease the final stage can of course be planned in advance.

Permanent Amputations

As regards general technique, a tourniquet should be used for the lower but not the upper limb, as in the latter it is unnecessary (the artery can be controlled by the digital pressure of an assistant) and also possibly harmful (the arm tolerates even temporary anaemia less well than the leg), a flat Esmarch bandage being alone permissible.

Flaps used to be made much too long, owing to the teaching of surgery classes where operations were done on the dead body, the skin of which is inelastic. In the living body the skin is elastic, and a total length of flap of one diameter of the limb is fully adequate. If the flaps are too long a pouch is left in which blood and serum can collect and become a nidus for infection; and, also, the final stump, though fittable, is likely to become sulcated and eczematous from the rubbing of the artificial limb. Only a part of the muscles should be retained sufficient to ensure the blood supply of the flaps.

The best stumps for limb-fitting are the thin and conical. The ideal flaps will be described below, but it must be remembered that in many cases their shape and length will be determined by the skin available and the nutrition of the limb. It would be absurd to employ the same length of flap in a case of arterial disease as in one of an injury to a healthy person. It may well be right to preserve length in a stump at the cost of placing the scar in a relatively unsatisfactory position. In dividing the bone it used to be thought necessary either to remove the periosteum from the last half-inch or to retain a cuff of periosteum from the bone removed that could be made to cover the sawn end. Actually no special treatment is required and the periosteum is divided at the same level as the bone.

At one time it was considered correct to shorten nerve ends and even to inject them with alcohol. The latter practice leads to an alcoholic neuritis and must be abandoned. A nerve bulb must form on the end of a cut nerve, and all we can do is to place the bulb where it will receive a minimum of pressure. This site will generally be the end of the stump, on which the socket does not press. Nerves should therefore not be shortened. Tying off with catgut is perhaps permissible, but the nerves should not be crushed; the less trauma they receive the less trouble they give later. Haemostasis should be performed with the greatest care and no drainage employed. On the question of drainage I am aware

that some surgeons will disagree, but I must speak from my own experience.

An amputation which bleeds but slightly at the time is always suspect and tends to bleed later when the blood pressure rises. In such cases it is as well to massage the limb above and to wait long before finally suturing the wound. It is best to ligature every bleeding point, however small. A copious dressing, firm bandaging, and the control of the knee or elbow by a splint for forty-eight hours will complete the operation. The splint should be removed as soon as possible, as it is important that the voluntary use of neighbouring joints should be preserved.

Amputation of the Arm

It is a fairly safe rule that as much as possible of the limb should be preserved. The possession of one perfect digit is preferable to the best artificial arm, as a prosthesis can be made to which this digit is opposable. Also, much can be done by tendon transplantation to improve a damaged hand. Amputation of the fingers has been considered in a previous article in this series, and it will suffice to say that the temptation to operate for the removal of tender digital nerve bulbs must be resisted, as this nearly always makes matters worse. There occurs an ascending neuritis which may lead to progressively higher amputations, with no benefit to the patient.

The ideal sites for amputation are eight inches below the acromion for the arm and six to seven inches below the olecranon for the forearm. The skin is very elastic, and short equal flaps from the flexor and extensor aspects of the forearm should be employed. Similar flaps should be used for the arm. The arm is a sense organ, and its sensation is far more extensively represented in the brain than is that of the leg. Accordingly, "phantom" limb is far commoner in the arm than in the leg. A patient will often feel the effects of an injury that occurred even a considerable time before the amputation. Pain is often agonizing, and for this reason also amputation of a part of the arm must never be undertaken lightly, even when the limb is useless, especially if the patient is of a "neurotic" type. Removal of nerve bulbs is worse than useless, as the pain is central in origin and the removal only adds extra trauma. The only treatment is by nerve sedatives, the wearing of an artificial arm, and occupation of mind.

Artificial Arms

Sockets are made of block leather, metal, or certalamid. Artificial hands operated by the patient have generally proved clumsy and unsatisfactory, but they are used occasionally, and are moved by the action of appendages and cords attached to the shoulders. Where no mechanical hand is to be fitted, forearm amputations are provided with a hinge at the elbow and a simple corset round the arm. The patient is supplied with a "dress" hand having a thumb working on a spring, with which, say, a book or paper can be held. In addition other appliances are supplied suitable to the occupation of the patient, all being made to be snapped in in place of the hand. A C-hook is very useful as it can be used for pulling, pushing, or torsion. Where the arm is weak it is advisable to fit an adjustable lock at the elbow to enable the joint to be fixed at any angle desired and to avoid strain.

For above-elbow amputations shoulder harness is used; the elbow is flexed by moving the shoulders forward and so pulling on a cord. There is also a mechanism which enables the patient to lock the elbow at any angle and release the catch at will. This is operated by the patient forcing the stump down into the socket and so pulling on a second cord attached to the shoulder harness.

In above-elbow amputations the bisection of the forearm prosthesis, which allows of pronation and supination of the hand, is placed as near the elbow as possible in order to throw a minimum strain on the elbow-flexion cord. Instruments are snapped in to this short forearm, the dress-arm being of normal length.

Amputation of the Leg at or near the Hip-joint

Where this operation is performed for disease the eradication of the diseased tissue is the primary consideration, and in not more than half the cases will the patient ever wear an artificial limb. In these cases the amputation will be through the hip-joint. Where, however, the hip-joint is intact one should contemplate the wearing of a "tilting-table" limb (see below) and make the best stump for this purpose. At least the head of the femur should be left, the neck being sawn through, as its presence prevents the stump from sinking in. If possible, however, the amputation should be made just below the lesser trochanter. The ilio-psoas flexes the stump and the patient's hip is in the sitting position. The retention of the great trochanter and the flexed stump provide points to which the socket can be fitted closely, helping to prevent the stump slipping out of it, a principle which we shall meet again when considering the leg. Flaps will be planned according to circumstances, being of the same shape but shorter or longer according to the level of the bone section.

The old operation by equal lateral flaps is quite satisfactory, but by far the best is as follows: From the anterior superior spine to the adductor longus tendon a short anterior flap is made and turned up. Double ligatures are placed on artery and vein and the vessels divided between them. From the above points a large posterior flap is made composed of the whole gluteal region. This flap is well nourished by the gluteal vessels, which expend themselves in the flap, and bleeding is slight. The tuber ischii, which must bear the weight, is well covered, and the patient sits comfortably in the socket.

Amputation through the Thigh

Except in the rarest cases a stump measuring less than five inches from the top of the great trochanter cannot be fitted with a limb giving hip control, and if this amount cannot be retained amputation as above should be performed. At a point below this a stump should never reach lower than four inches above the adductor tubercle, as a longer stump interferes with the mechanism of the artificial knee-joint and is ill nourished. The ideal length is ten and a half inches, measured from the top of the great trochanter. Equal flaps, lateral or antero-posterior, may be used, but the ideal is a long anterior and very short posterior, the scar being placed at the back. Hamstrings should be cut rather short, as if they become adherent to the scar the necessary action of bracing the stump back in the socket when walking may be painful from the involvement of cutaneous nerves. The sciatic nerve should be left untouched for the reasons stated above.

In practically every case a bony spur will grow from the postero-internal aspect of the bone end. This does no harm, is not preventable by any special treatment of the periosteum, and operations for its removal are not necessary unless the spur is adherent to the scar, which, if the flaps are well planned, should never be the case.

The Stokes-Gritti operation is quite obsolete. The stump is too long and the patella often becomes displaced forward. The Stephen-Smith amputation through the knee-joint is retained only for certain cases of arterial disease. The necessary prosthesis is clumsy, as it is impossible to fit a neat knee-joint.

Below-knee Amputations

In the last century an amputation allowing for the fitting of a peg-leg on which the patient knelt was rightly in favour, and such is still our only method of obtaining a good natural weight-bearing end to a stump. For this a stump of under three inches of tibia should be left. Occasionally, even, one has to supply legs which differ only slightly from those in use in Nelson's day, but generally a somewhat more sightly limb is possible. It is clumsy but will solve many difficulties. From 1920 to 1930 we regarded a tibial length of seven inches as ideal, but it has been found that as the patient grows older this stump becomes ill nourished and that one of five and a half inches is better. Equal lateral flaps are to be avoided, as the antero-posterior scar tends to be drawn up between tibia and fibula, leaving a stump resembling a pair of "shorts."

The best amputation is as follows: A one-inch anterior flap is turned up composed of skin only and a posterior flap made shelving from skin at the extremity to the full thickness of muscle at the base. The bones are cleared and the fibula divided first with bone-forceps three-quarters of an inch above the intended section of the tibia (to prevent cross-union). The tibia is then divided and the anterior edge bevelled. Nerves are left untouched. The advantage of the posterior flap is that should, as rarely, the anterior end of the tibia tend to press through the skin a reamputation can generally be done without further sacrifice of bone. The head of the fibula should always be retained. As in the case of hip-joint amputations the socket can be fitted closely to it, and its presence helps to retain the stump therein.

Syme's Amputation

This still has its advocates. The operation originally described by Syme is obsolete, as the heel-flap was too voluminous and the stump left too little room for the fitting of an artificial ankle. The modern incision is an elliptical one crossing anteriorly just above the ankle-joint and posteriorly half an inch to one inch in front of the point of the heel. The foot is removed from above downwards after disarticulation of the ankle, and the bone is divided half to three-quarters of an inch above the ankle-joint. The posterior tibial artery should be respected, and in this case the nerves should be shortened as it is intended that the stump should be end-bearing.

I have performed this operation many times on natives in the East, mainly for shark-bite, and the results have been very satisfactory. No artificial limb has been worn, of course, and the patient has got about very well. The same applies to the wearing of an "elephant boot"—a simple leather bag with a sole; but where the patient is fitted with an artificial limb encasing the leg, and with a foot, the operation is not permanently satisfactory. Circulation is impeded, and there are traction on the muscles and friction of the skin. The heel flap is drawn up posteriorly and there is periostitis and ulceration of the stump end.

The mid-tibial amputation is far more satisfactory for civilized man. The Chopart and Lisfranc operations are obsolete, as in the former the os calcis becomes displaced backwards by the pull of the tendo Achillis, and in the latter it is difficult to preserve an adequate arch to the foot.

After-treatment of Amputations

The splints applied to control knee or elbow should be removed after forty-eight hours and free movement allowed. As soon as the wound is soundly healed active exercise of the limb should be encouraged. Massage is of doubtful benefit. At this time treatment should be begun, directed to obtaining shrinkage of the stump to its final size before limb-fitting is attempted. The stump should be kept bound either by a simple bandage or preferably by elastoplast.

In above-knee amputations, and less often in those below the knee, "pylons" are used. These are temporary sockets, made of plaster-of-Paris, to which are fixed wooden ends similar to the lower ends of crutches. They are cheap, can be reapplied, and the patient, by being enabled to get about, retains movement in his joints and encourages the shrinking of the stump. A patient should not wear a pylon till up to three months after the amputation and his stump is in a condition to permit the fitting of a permanent limb.

Artificial Legs

For an amputation near the hip a "tilting-table" limb is fitted. The pelvis rests in a socket, and below this the leg is attached by a simple hinge, capable of being locked or released by a catch easily operable through the clothes. The catch is released for sitting and fixed for walking, in which the hip is rigid and progress made by a swing of the pelvis.

For thigh amputations there are really only two types of prosthesis, the choice between these depending on the patient's power of bracing back the stump and so controlling the extension of the knee. If strength is good the limb is suspended from the pelvis and the knee movement checked by an adjustable brake at the knee. In other cases the limb is suspended from the shoulders and knee extension is performed by means of a roller cord activated from the shoulders and working on an eccentric in the knee-joint. If the stump is very weak a rigid pelvic band can be added.

For below-knee amputations in which the stump is very hard and healthy a socket, knee hinge, and thigh corset may suffice, weight being taken on the heads of tibia and fibula and the lower edge of the patella; but experience has shown that this is rarely possible and that it is better to take some of the weight on the pelvis by fitting a limb with a bearing on the tuber ischii. This is certainly the case in growing children, as there is a danger of hyper-extension deformity at the tibial epiphysis. The ankle works on a simple hinge with roller bearings, movement being checked in front and behind by rubber buffers. In cases where there is a tendency for the knee to shoot forward increasing the thickness of the anterior buffer will help.

Sockets for above-knee amputations are made of duralumin or wood, those for below-knee amputations of block leather or wood.

Frontal and Ethmoidal Sinusitis.—Patterson advocates the external operation for severe cases of frontal and ethmoidal sinusitis. The site of the incision is discussed.—External Operations on Frontal and Ethmoidal Sinuses. N. Patterson. —*J. Laryng.*, May, 1939, **54**, No. 5, 235.

THE STORAGE OF RADIUM IN WAR TIME

BY

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St. Bartholomew's Hospital

On the outbreak of the present war practically the whole of the supplies of radium in London were concentrated at four centres and were placed for security in suitable containers at the bottom of specially prepared bore-holes fifty feet deep. This method of storage was designed in the first instance simply as a temporary measure, until the different bodies and institutions responsible for radium treatment could elaborate plans for war-time radium service. In most cases it was not contemplated that frequent or daily raising and lowering of the radium in the bore-hole would be required as part of a war-time radium service. During the present phase of the war, however, the question of carrying on radium treatment in London has become an urgent one, and demands a reconsideration of the suitability of the bore-holes for radium storage where regular treatment of patients has been resumed or is contemplated.

The following description of the arrangements made at St. Bartholomew's Hospital for storing radium needles, etc., so that the radium service could be maintained when desired may be of interest to others who are faced with similar conditions. Special attention has been given here (*a*) to the protection of the personnel, and (*b*) to the ease of access to the radium supplies, as well as to safeguarding the radium from the effects of high explosives or accidental loss. To secure these aims a special radium "bucket" has been designed, which is loaded and unloaded in a separate protected loading-hole situated by the side of the main bore-hole. The transference of the bucket from the one hole to the other is effected in a few seconds by a swivel jib and windlass.

The Radium Bucket

The radium bucket takes the form of two co-axial brass cylinders provided with rigid handles, the inner one of which

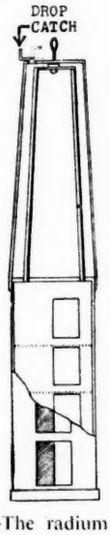


FIG. 1.—The radium bucket.

can be rotated with respect to the outer cylinder (Fig. 1). The inner cylinder is divided into four compartments, each provided with an opening big enough to permit the introduction of the largest radium package it is desired to store. Corresponding openings are cut in the outer cylinder, and the operation of opening or closing the inner container consists merely in rotating it through 180 degrees, the correct relative disposition of the holes being ensured by a drop-catch which locks the handle-bars together. The use of swinging doors and of a separate lock and key to each compartment has been eliminated, and it is possible for the operator to open or shut the container in the hole without bringing his hands nearer than two feet from the radium.

The Loading-hole

The loading-hole is of the same diameter (eleven inches) as the main bore-hole, but extends only from the ground level up to a height of four feet. Together with the main bore-hole it is encased in a mass of masonry, the wall on the operator's side being made of barium concrete six inches thick. The radium is loaded and unloaded through a hole in this wall about two feet above the floor, the openings in the bucket being maintained in correct register by drop-catches situated at the top of the hole which engage the handle-bars. Suitable marks on the handle-bars enable the operator to adjust the level of any compartment with respect to the hole by a slight turn of the hand winch. The introduction and withdrawal of radium from the bucket only while it is in the loading hole removes all possible risk of dropping radium containers to the bottom of the fifty-foot bore-hole.

Protected Table

A protected table, enclosed on two sides by the concrete wall and block of masonry respectively, serves as a convenient place of temporary storage of radium containers while the bucket is being lowered to or raised from the depth of the bore-hole. A perspective drawing of the building covering the bore-hole is shown in Fig. 2. The dimensions of the building are 7 ft. 6 in. × 9 ft. × 10 ft. high, its unusual height being necessary to provide clearance for the jib when swinging the four feet tall bucket from one hole to the other. It is

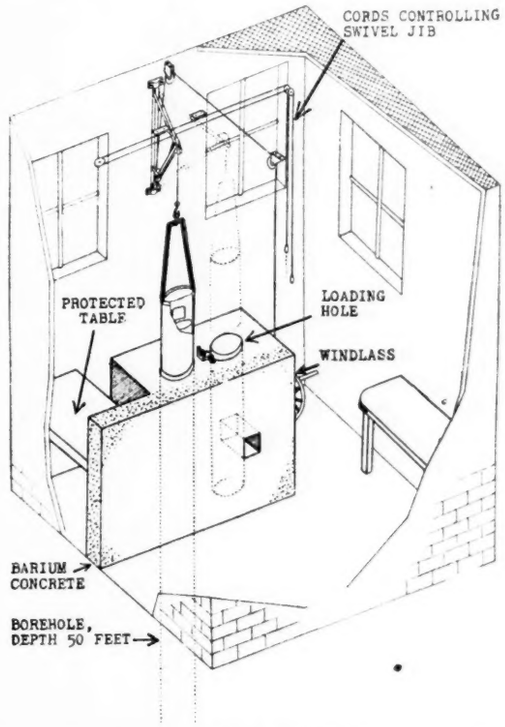


FIG. 2.—Apparatus used for raising and lowering the bucket containing radium.

situated in an area outside the main hospital buildings, but in convenient proximity to the room of the radium custodian.

Thanks are due to Mr. P. W. Hubbard, F.R.I.B.A., architect, and to Mr. Nye, clerk of the works, to the hospital, for their co-operation in planning this scheme and carrying it into effect. The cost of the bore-hole has been defrayed by the King Edward Hospital Fund for London.

SAFEGUARDING WATER SUPPLIES

The report of the Water Pollution Research Board for the year ended June 30, 1939, has been issued by the Department of Scientific and Industrial Research.[1] In an introductory statement the Board calls attention to the importance of adequate methods of treatment of waters for public supply which are in any way liable to pollution, and of frequent collection of samples for chemical and bacteriological examination. Greater vigilance is needed in protecting existing and future sources of water supply from undue contamination by the discharge of polluting substances. These measures are especially necessary during war time, when there are movements of large numbers of people from one district to another; under these conditions ample supplies of unpolluted water and satisfactory arrangements for sanitation are of vital importance. Research carried out under the supervision of the Board includes investigations on the treatment of water for domestic and industrial purposes, the treatment and disposal of sewage and trade effluents, and on problems of pollution of rivers.

Lead in Drinking Water

In many districts in this country the water available for public supplies has a corrosive action on certain metals, including iron, steel, galvanized iron, copper, and lead, of which mains, service pipes, and fittings are usually constructed. The action of water on lead is of particular importance from the point of view of public health, since poisoning may result from use, over long periods, of drinking water containing even small quantities of lead. The opinion has been expressed by some authorities that a concentration of even less than 0.5 part per million is dangerous. One method of treatment of water to reduce its corrosive action on lead and other metals consists in passing the water through beds of pieces of limestone, marble, or similar substances. This method is particularly attractive for rural districts and remote localities, since the plant, when properly designed, should require little skilled supervision. Several such plants are already in use in rural areas, but much further information is required on the design and methods of operation of this type of plant if satisfactory results are to be obtained, particularly in the treatment of certain types of water. The Board is making a systematic investigation of this problem. Suitable apparatus and methods of analysis were first developed for the determination of small quantities of lead taken up by water in passing through service pipes. Visits were then made to waterworks where water is treated by passage through beds of limestone, and samples of the raw water and treated water were taken for analysis. Arrangements were then made to carry out experiments on the treatment of water in filters containing pieces of limestone, both in the laboratory and on a large scale.

Bacteriology of Fresh Water

An investigation on the bacteriology of fresh-water lakes and streams was begun in May, 1938; this work is being carried out for the Board by the Freshwater Biological Association. A laboratory has been specially equipped for the work at the association's research station at Ambleside. The object of the investigation, which is carried out in close association with the chemical, zoological, and botanical work of the Freshwater Biological Association, is to study the factors which govern the abundance and the types and biochemical activity of bacteria in fresh water. An investigation of this kind should yield valuable information on the part played by bacteria in the cycle of life not only in rivers and lakes but also in water-supply reservoirs, where measures often have to be taken to reduce the activity of certain types of organisms which give rise to difficulties in the treatment of the water before distribution.

[1] Published by H.M. Stationery Office. (1s. net.)

Milk Factory Effluents

The Board's investigation of the problems of treatment and disposal of the highly polluting waste waters from milk collecting and distributing depots, and from the manufacture of cheese, butter, and other products from milk, was begun five or six years ago. In 1935 two large experimental plants were erected at the milk depot and cheese factory at Ellesmere, Shropshire, where facilities were afforded by United Dairies Limited. Methods of treatment of the waste waters which had previously been investigated in the laboratory were tested in the two large-scale plants. These experiments, which were completed during the autumn of 1938, have proved that it is practicable to purify the waste waters either by the activated sludge process or by treatment in two percolating filters in series with periodic change in the order of the two filters. The conditions necessary for the satisfactory operation of these processes in the treatment of the waste waters from the various branches of the milk industry have been ascertained. As a result of the investigation it is now possible to design plants to treat economically the waste waters from all branches of the milk industry; full-scale plants based on the results of the investigation are already in operation at ten or twelve factories in this country.

Treatment and Disposal of Sewage

The method developed by the Board for the treatment of dairy waste waters in two percolating filters in series, with periodic change in the order of the filters, is in some respects an elaboration of the method used at many sewage-disposal works, where settled sewage is passed through a single percolating filter. For a given volume of filtering material, however, the volume of dairy waste waters which can be treated daily by the new method is considerably greater than the volume of sewage which can be treated by the method of single filtration, allowance being made for the difference in strength of the two liquids. Moreover, the quality of the effluent from the double-filtration process was much better than is usual at many sewage-disposal works. This at once suggested the desirability of experiments on the treatment of domestic sewage by the double-filtration process. If the amount of sewage which can be efficiently treated by double filtration with a given volume of filtering medium is only 50 per cent. greater than by single filtration, the adoption of the new process should lead to considerable reductions in the extensions required at many sewage-disposal works.

In addition to this work on the treatment of sewage by biological filtration, experiments have been continued in the laboratory on the treatment of sewage by the activated sludge process. Among the factors investigated were the effect of temperature, proportion of activated sludge, and the acidity or alkalinity of the mixture of sewage and sludge. Experiments have also been made on the effect of acids and alkalis, mineral salts, and organic substances on the rate of sedimentation of fine particles from suspension in water.

The following medical promotions in and appointments to the Venerable Order of the Hospital of St. John of Jerusalem were announced in the *London Gazette* of January 2: as Commander (Brother), Dr. J. Welsh; as Officers (Brothers), Mr. A. F. MacCallan, C.B.E., F.R.C.S., Captain N. W. Rawlings, Dr. F. L. Newton, Captain W. A. Rees, Dr. J. Forbes, Lieutenant-Colonel A. C. L. O'S. Bilderbeck, I.M.S., Colonel G. G. Jolly, C.I.E., I.M.S., Colonel R. S. Townsend, I.M.S.; as an Associate Officer (Brother), Dr. S. N. Saxena; as Officer (Sister), Dr. Catherine S. Edgerley; as Serving Brothers, Lieutenant-Colonel J. Rigby, T.D., Dr. E. H. Lodge, Dr. H. J. Hoby, Lieutenant-Colonel J. C. John, O.B.E., I.M.S., Dr. D. Aneuryn-Evans, Dr. J. F. Hamilton, Dr. A. Murdoch, Dr. J. L. Johnston, Dr. R. A. Milne, Dr. A. Johnston, Captain G. F. Shepherd, Dr. W. B. Fox, Dr. J. R. Hanna, Dr. H. E. Thomas, Lieutenant-Colonel A. R. Southwood, Dr. E. R. Symons, Dr. H. J. O'D. Burke-Gaffney, C.M.G.; as Serving Sisters, Dr. Alice M. Burn, Dr. Margaret W. Anderson.

Nova et Vetera

VITAL STATISTICS FROM OLD PARISH REGISTERS

The basis of a parish history is a well-kept register. Registers were first instituted in 1538, but only a few parishes possess a continuous record from that date. The record is always defective, being for the earlier years, at least, a mere catalogue of names of infants baptized and people buried, with the dates when those ceremonies took place. During the seventeenth and eighteenth centuries more detail was entered: the parentage of infants is recorded, though the mother may be omitted; and, in burials, relationship and age are given, with occasionally other particulars, such as residence, rank or profession, etc., and cause of death. Even where the register consists merely of names and dates it is possible to learn something of the life and condition of the parish. A study and analysis of the register of the parish of Petworth, Sussex, reveals something of the condition of a small market town in an agricultural district, without any other industry or a military garrison. It was uninfluenced by propinquity to the metropolis or other large town. Petworth may be considered typical of the greater part of England during the period the record covers.

The old register of Petworth begins in 1558, and is continuous to 1794, though there is a slight interruption in 1644–5. It contains 11,473 entries of baptism, 9,431 entries of burial, and 1,564 marriage entries up to 1754—a grand total of 22,468 entries.

Population of Petworth

During the 237 years treated of, the population of Petworth varied considerably: as no accurate record is known, it may be estimated from the register. Many years ago Mr. Marcus Rubin suggested that the average of baptisms for any ten successive years multiplied by thirty would give the population within 10 per cent. above and below. We have found this method work well in cases when the real population is known. Calculated by this method, in 1570 Petworth had a population of about 1,450. In 1610 it was about 1,300; in the next thirty years it increased to 1,500. During the Civil War and the unhealthy period 1655–8 the population rose, amounting to 1,650 in 1660. This increase must have been due to immigration, as during this period the excess of baptisms over burials was fewer than one hundred. In 1700 the population was about 1,680. From 1700 to 1760 there was a marked decrease to an average of less than 1,300, in 1740–50 dropping to 1,140 inhabitants. After 1770 there was a rapid rise to about 1,600. In 1790 the population appears to have risen to 2,200, a sudden expansion doubtless due to immigration.

Marriages

After 1754 marriages were by statute entered in a special register, therefore none appears in the old register book after that date. Of the 1,564 marriages before 1754 little can be said, except that they appear to be unevenly distributed. During the period 1560–90 in a population of 1,450 there were 343 weddings; during 1590–1620 among the same number of people there were 296 weddings; and in the next thirty years an increase of population was accompanied by a decrease of weddings to 253. This does not mean that matrimony was unfashionable in Petworth; people resorted to other places, for many parishes enjoyed a temporary popularity for the ceremony.

Baptisms: Evidences of Birth: Death Rate

The 11,473 baptismal entries comprise 5,857 boys and 5,616 girls—a ratio of 104 boys to 100 girls. This ratio was not constant; the proportion of boys was much larger in the earlier years. During 1560–90 there were 110 male to 100 female baptisms; then up to 1690 there was an excess of female children; and during 1751–80 there were 113 boys born to every 100 girls. The modern ratio is about 104 to 100.

Triplets are recorded twice—in 1602 and 1718; they all died. The baptism of twins is recorded 123 times—both boys 44; both girls 43; and mixed 36. The frequency of twin births was very high, being 1 in 50; the modern rate is about 1 in 88 births. Of the 246 children born twins, the deaths of ninety can be traced within a year of birth; probably 40 per cent. or even more died under a year old. Illegitimate children are indicated in 231 instances—113 boys, 118 girls. This excess of girls accords with the popular idea, though it is not so pronounced as in other registers. The deaths of thirty-one can be traced within a year—about 20 per cent.; the real rate must have been much higher, but identification is difficult owing to the imperfections of the register, especially in its earlier years. The birth rate can only be surmised, as the decennial average of baptisms has been used conjecturally to estimate the population. The rate was probably well above 30 per thousand, perhaps sometimes reaching 40.

The infant (less than 1 year old) death rate was very high. When names without details of age and parentage are entered in the burial register it is impossible to be sure of identity, but even with this drawback it is clear that the infant death rate in Petworth was more than 150 per thousand. During 1560–70 it can be proved that the rate was at least 160. During 1730–40 the register was so well kept with essential particulars that an infantile death rate of 200 per thousand is proved. It is probable that an infant death rate of 200 to 250 per thousand was usual throughout the realm up to the nineteenth century. Up to fifty years ago it was from 150 to 160. During 1937 the rate in London was 60 per thousand of live births. A few stillbirths are mentioned in both baptismal and burial registers, but do not enter into the foregoing statistics.

Maternal Deaths

The maternal death rate may be considered here. The death of a woman in childbirth was far from uncommon in the centuries before 1800: a close study and comparison of the baptism and burial register reveals this. It is only possible to identify such cases in parts of the register, as to do so the names of both parents must be recorded. These parts may be taken as representative of the whole. During the decade 1671–80 one mother in sixty-two died within a few days of her confinement; the less perfect record of 1691–1700 shows one in ninety-four died, and that of 1721–30 one in eighty-five. Women dying undelivered or after a stillbirth cannot be identified, as mention of the fact is very rare. The figures just given are the minima. The real rate was 1½ per cent. to occasionally 2 per cent. or even higher.

Deaths: The Burial Register

The most informative and interesting part of a parish register is the burials, which often record particulars not found elsewhere. From the burials can be deduced the mortality and progress of epidemic sickness over the kingdom, evidence of the effect of certain legislation, and sometimes reference to historic events. It is necessary to mention that all the ratios and averages here given, though probable, must be regarded as conjectural and also as the minima.

From 1559 to 1794 the total of burial entries is 9,431—4,899 male and 4,532 female. A high birth rate is always accompanied by a high death rate. During the period dealt with the adult rate was much higher everywhere than at the present time, and the expectation of life less. For the 237 years' record of Petworth the death rate seldom sank as low as 25 per thousand; for half the time it was 30 or more, and during epidemics rose to 50, and twice to 70 per thousand. In 1937 for London the rate was 12.5 per thousand. Every register shows years of increased burials, indicating epidemics—namely, 1593–5, 1602–3, 1625, 1637–44, 1657–8, 1665, 1683,

1713–16, 1727–30. All these dates coincide with known epidemics: an epidemic did not afflict the whole kingdom at the same time, but travelled over it, ravaging districts at a distance from the place of origin.

The Plague

The plague was frequent in England to the end of the seventeenth century. In 1559 in Petworth there were sixty-nine burials and thirty-eight baptisms, a death rate of 42 per thousand, certainly due to plague. The pandemic of 1593–5 reached Petworth in 1596–7, when there were 100 burials, the baptisms numbering 84. Under the date February 20, 1574, is the comment, "Here began the plague"; and an entry on July 29, 1575, states, "Here ended the plague." Between these dates fifty-eight people were buried, and the death rate was not less than 46 per thousand. Other entries are: on January 23, 1603, "William Pearle buried, the first that died of the plague"; and on June 28, 1604, "Alice uxor Mgi. Beache, the last that died of the plague." Several families lost two or more members, but the number of burials was not much above the average. A further entry, on November 7, 1606, is: "John James, senior, a peste, buried." This seems to be an isolated case of plague; there was no outbreak, and the twenty-six burials in that year were below the average. In 1609 there were seventy-three burials. The years 1609–12 were very fatal: the 200 burials were associated with 176 baptisms, showing a decrease in population.

There is no mention of plague after the Restoration, though an increase in the burials after 1665 may include cases. During 1651–60 the death rate in Petworth was at least 30 per thousand, occasionally higher. In 1657–9 there was a considerable rise in deaths all over the kingdom, due to malaria, which was widespread and very deadly. Cromwell died from that cause. There was great mortality in Petworth all through the "golden days" of Charles II. During the twenty years after the Restoration, 1660–80, the baptisms numbered 1,108 and the burials 1,063. Actually the population diminished: estimated in 1661 at 1,650 people, in 1671–80 it fell to about 1,470. The death rate during that time was over 40 per thousand. In 1685 there were 107 burials in a population estimated at 1,530, a death rate of 70 per thousand. The cause of this is unknown.

Influenza in the Eighteenth Century

There were several epidemics of influenza in the eighteenth century. During the pandemic of 1710–16 the death rate was high throughout the kingdom. In 1711 there were ninety-four burials in Petworth and only twenty-eight baptisms. The population was not more than 1,300, so the death rate for the year was not less than 72 per thousand. Influenza was rife in Europe from 1727 to 1730, and spread to England, much increasing the mortality. In Petworth during 1727–9 there were 165 burials and 109 baptisms. It is not surprising, therefore, that the population diminished, reaching its lowest level of less than 1,200 during the fifth decade of the century. In 1729 the death rate was 51 per thousand, and in 1742 it was 43 per thousand. In the period 1751–60 the population is estimated at about 1,320, perhaps representing a "survival of the fittest," as the mortality was the lowest up to date—namely, 22 per thousand. There were during this decade 445 baptisms and 300 burials.

The influenza epidemic of 1782 does not appear to have affected Petworth, as only forty burials are recorded, though in 1783 there were fifty-four, but only thirty-two in the following year. The population then is estimated at 2,200, an increase certainly due to immigration. The death rate during 1781–90 averaged about 18.3, the lowest in the register.

Small-pox

Small-pox seems to have been always more or less common in England, and after the disappearance of the plague became the chief menace to life until vaccination was discovered. Though a frequent cause of death, small-pox is not mentioned in the register until 1719. In 1729 ten deaths are assigned to this cause, and fairly often in following years. The increased number of deaths in some years may be attributed to small-pox, for the disease was endemic and local outbreaks common.

Foundlings: King's Evil: "Briefs"

In 1760–2 five "foundlings" were buried. The Foundling Hospital in London received without questioning all infants, and sent many to foster-parents in the country, paying for their keep. The mortality of these children was nearly 100 per cent.; they died from neglect or improper feeding. Probably more came to Petworth and there died than were recorded.

During 1684–8 are recorded the names of thirty-eight individuals to whom certificates were granted for "His Majistyes Sacred Touch." In one family four were certified and in two other families two each.

Between 1658 and 1710, 196 "briefs" are recorded. Many of these collections in church were for places ravaged by sickness. In 1665 Petworth collected, "for the month by fasts for removal of the plague," on August 2 £8 7s. and on September 6 £7 12s. There were five of these "fasts," but those in October, November, and December are not in this record.

W. B. and J. R. C.

Correspondence

R.M.B.F. Christmas Gifts

SIR,—If it were possible it would be my wish to ask you to publish a few of the many letters of thanks for Christmas gifts which have been received so that your readers could judge of the sincerity of the gratitude felt by the beneficiaries of the Royal Medical Benevolent Fund. On their behalf and on my own I desire to express my warmest thanks to you and to your readers who so generously responded to my Christmas appeal.

The total received was £1,077, which is within a few pounds of the sum contributed last year. The good will shown in fully maintaining our Christmas gifts fund during these difficult days is more than gratifying and encourages me to hope that during this new year the whole profession will not forget how urgently the Royal Medical Benevolent Fund will need its help.

I know that in many districts, owing to the cancellation of medical meetings, collections could not be made as in previous years, but my special thanks are due to those officials who of their own accord gave their personal time in collecting from their members. In my appeal letter of December I said that time was short; in this letter I can say with all truth, "Time was not too short for generous hearts."—I am, etc.,

Royal Medical Benevolent Fund, Wormingford, Essex, Jan. 6. THOS. BARLOW, President.

The Spas in War Time

SIR,—At the present moment the British spas stand in danger of being put out of action. Will you kindly allow us to point out the damage that this will bring about, not only to the spas themselves but to much wider interests.

(1) *The British Spas* are a small but unique group of health resorts which have been developed in the course of years by the local authorities or private owners. They have been equipped for modern hydrological and physical treatment, and are practically the only places that offer such facilities in this country. They have also perhaps unique medical indications—the prevention and alleviation of rheumatic and other forms of chronic illness, the after-treatment of accidents and injuries, and the rehabilitation of disabled men. Great numbers of military cases were treated at the spas in many European countries during and after the last war. It is quite certain

that even the temporary closure of a spa at the present time, involving the dispersal or reduction to a minimum of its trained staff, will seriously endanger its future. During the war it will be deprived of a great opportunity of increased work, when no invalids can leave the country. And after the war, until the knowledge and experience, the skilled service and technique, can be reconstructed, large numbers of British invalids, and their money, will go abroad for the spa treatment which they need.

(2) *The British Spa Hospitals*, one of which has just celebrated its second centenary, are of private foundation and designed and equipped for the use of the poor who are affected with rheumatic disease. They have won the right to be regarded as of national importance, both in peace and in war time, and have always hitherto been used for their special purpose. All these hospitals, so essential also to the scientific work of the spa, have now been emptied and commandeered for casualties. It would have been better to extend and improve their equipment for military cases. A little wise development of these institutions would be of the greatest value when peace returns, for it is well known that their present accommodation is far short of requirements. In the circumstances we hope that the Government will see its way as soon as possible to restore the spa hospitals to the uses for which they were founded. We are informed that permission has now been received for a few beds to be temporarily occupied by rheumatic patients, but that this would entail administrative and economic difficulties. Meanwhile, with a constantly increasing number of applicants, the institutional treatment of the rheumatic diseases has nearly come to a standstill.

(3) *Hotels*. The necessary accommodation for spa guests is provided: (1) for private patients, in hotels adjacent to or communicating with the baths; (2) in special clinics; (3) in the spa hospital, for patients mostly insured or assisted. The present commandeering of the principal hotels, including some nearest to or communicating with the baths, has made it extremely difficult for invalids with independent means to obtain the necessary treatment.

As regards the bath establishments and their associated hospitals and hotel accommodation, it seems to us that some reconsideration of the present demands is required, so as to permit them to continue their activities for the benefit of all classes of the population, and also to make their special contribution to the restoration of the men who are wounded and invalided in war.—We are, etc.,

E. FARQUHAR BUZZARD,
President, International Society of Medical Hydrology.
ROBERT HUTCHISON,
President, Royal College of Physicians.
HUMPHRY ROLLESTON,
Late Chairman, British Committee on Rheumatism (Royal College of Physicians, 1933–8).
R. FORTESCUE FOX,
Late President, Ligue Internationale contre le Rhumatisme.

Jan. 2.

Endotracheal Anaesthesia

SIR,—While congratulating Sir Robert Kelly (*Journal*, January 6, p. 32) on having introduced Meltzer and Auer's method of twenty-seven years ago, and on furthering the use of intratracheal anaesthesia, we should like to point out that there is a very widely held opinion that the modern inhalation method is a notable improvement on the pressure system he introduced. Some of us have had the experience in the last war of observing perhaps a thousand anaesthetics given with positive pressure, of noting the results, and of being in a position to compare these results with those obtained by the two-tube method, and, later, the large soft tube coupled to a rebreathing bag. Without the least shadow of doubt our experience would dictate that the soft-tube inhalation method is as big an advance on the insufflation as that was on previous methods, and we welcome this opportunity to place on record our loyal appreciation of the work of Magill in the development of anaesthesia of this type. In fact, he and his followers and colleagues have placed British anaesthesia in a position of international repute which it is a delight to observe.

With regard to passing the tube by the nasal route, which Sir Robert Kelly adversely criticizes, we are able to state that in a series of many thousands of war and civil cases we have never encountered a case of infection carried to the lungs that was attributable to the proper passage of the tube. All workers, however, avoid intubation in acute inflammatory conditions of the upper air passages.

The advantages, as we see them, are as follows: (1) In the inhalation method respiration is physiological. The right heart is not subjected to any stress, as is liable to happen when subjected to pressure anaesthesia. Here it is essential to point out that pressure in the insufflation method must be maintained in order to keep the airway clear of blood. (2) The trachea is protected from the entry of blood by a pharyngeal pack or inflatable cuff. (3) The patient has the minimum of ether administered. (4) In oral operations the surgeon is not embarrassed by anaesthetic apparatus. (5) If the nasal route is used the introduction of the special catheter into the trachea is readily done after a moderate amount of practice, even at a light stage of induction anaesthesia. (6) And last, but not least, the operator is saved from the constant reverse blast of the second-hand ether which is a prominent accompaniment of the insufflation technique.

Technical errors in administering both methods must naturally occur, but at least the disaster of blowing up the stomach, with, as we have observed, fatal results, cannot arise in the inhalation method. We can claim a very special experience in both methods, and feel constrained to uphold the newer not only because of their proved results but also on account of the splendid body of anaesthetists, both young and old, who have striven to perfect themselves in this Magill-type technique.—We are, etc.,

H. D. GILLIES.
T. POMFRET KILNER.
A. H. MCINDOE.
RAINSFORD MOWLEM.

London, Jan. 8.

Closed-circuit CO_2 Absorption Apparatus

SIR,—You kindly published a note on a simple CO_2 absorption apparatus of mine. I have received a considerable number of letters about it addressed to the Berkshire Hospital. I wonder if I might ask any further correspondents to write to my home address, Westcote Road, Reading.

For general guidance I might say that no firm at present makes the apparatus; it was purely home-made.

The other most general question asked was whether an oxygen flowmeter was used. I have obtained perfectly good results from just a very small trickle of oxygen coming through in the ordinary way.

I have derived considerable interest from the recent correspondence on war-time anaesthetics. Service anesthetics differ very considerably from civil. I have on several occasions given anaesthetics at Naval hospitals during the past fifteen years. The hefty healthy sailor takes considerably more knocking out than the average weedy civilian that you meet in the theatres of voluntary hospitals. You are thus faced with the necessity of pumping in strong ether continuously, or else of thinking out some better method.

I have just completed a series of some 300 cases on evipan (lately changing to pentothal, which I now prefer) followed by spinal anaesthesia. The spinal anaesthetic has been percaine given by the Howard Jones method; or else methycaine according to requirements. All inductions, whether followed by spinal anaesthesia or not, are done with pentothal. In all operations on the head and neck, and in high abdominal operations in which ether is required, the administration is endotracheal with closed circuit. Avertin, which is so valuable in private work, is not of much use in the Service as the technique is rather too complicated.

I certainly think that where inhalation of ether is used the results are 100 per cent. improved by endotracheal administration via a closed circuit as a routine.—I am, etc.,

Jan. 4. H. PARRY-PRICE.

Rationalization of the Casualty Services

SIR,—At present each county and county borough council is responsible for running a scheme comprising ambulances for seriously wounded persons, cars for less seriously wounded, with the necessary drivers and attendants, and a service of stretcher-bearers. These proceed to scenes of devastation and, after preliminary attention, transport the wounded to first-aid posts or hospitals according to the nature of their wounds. In addition, a varying number of movable first-aid posts are available to go at short notice to any place where the damage has been excessive. The stretcher-bearers are located in first-aid party depots; the ambulance personnel in ambulance depots. This is the so-called first-aid service.

The hospital service, which is to deal with wounded after the preliminary attentions of the first-aid service, is organized on an entirely different basis, and the county or county borough council is not made directly responsible. The county or county borough medical officer of health is in control of the Emergency Hospital Scheme as the agent of the Ministry of Health.

The results of this differentiation are unfortunate. Because the Local Government service is responsible only for that part of the scheme which precedes hospital treatment much greater emphasis is laid upon it, so that in the minds of the public it has become to be the most important part of the casualty services. As Dr. Trueta's revelations are making plain, however, it is the hospital which is the important element in the scheme for dealing with air raid wounded. In addition, the first-aid services acting separately lose much that they would have gained from association with the age-old tradition of the hospitals. In fact, the impartial observer must be struck with the anomaly which has permitted dressing stations to be set up in many places away from hospitals, and which, in cases where the first-aid posts are situated at or near hospitals, permits them to remain outside the latter's administrative control.

There is a third disadvantage—namely, that the personnel for the one service remain quite distinct from those of the other. The personnel of the first-aid services are, in fact, to a large extent being employed on a whole-time basis with considerable expenditure of public moneys, when the neighbouring hospital might, without dislocation of its own service, provide the staff in emergency. Thus it is not uncommon for whole-time personnel to be employed at a first-aid post and sit during their hours of duty with little or nothing to do, when in the neighbourhood a hospital employs nurses who, in the emergency, at least during the first part of an air raid until volunteer personnel arrive, might be permitted to staff the dressing station. At the same time the first-aid service may be employing men as stretcher-bearers who, in the present period of relatively inactive warfare, have nothing with which to fill their hours of duty, while the neighbouring hospital, which may have been enlarged and even now may be receiving Service sick, is in need of hospital orderlies.

In view of this it would be of great benefit now wherever possible to unify the two services, and with this in mind the following steps are being taken in this county:

1. The fixed first-aid post, wherever situated at a hospital, is being placed under the administrative control of the hospital, the matron being responsible for it in the same manner as for other parts of the hospital. The hospital guarantees to provide sufficient nurses at the outset of an air raid to deal with the first rush of wounded on the understanding that the local first-aid organization sends volunteers as soon as possible. This obviates the need for personnel to do hours of duty in the post, but where they wish to do so they work during attendance in the hospital wards. It is a little uncertain whether this step necessitates increasing the staff of the hospital. The arrangement is being put in hand in eight out of twenty fixed posts in the county, and in two instances it has been decided to increase the hospital staff by three resident nurses, whose wages are refunded as whole-time A.R.P. workers.

2. Similarly where the ambulance depot is at a hospital the first-line ambulance attendants or a sufficient number are supplied from the hospital staff. This is likely to prove possible in only five cases.

3. Where the first-aid party depot is at the hospital the men are asked to act as hospital orderlies. This is possible in six cases, and in two where Service sick are now being received the arrangement is proving extremely useful.

4. In the case of mobile first-aid posts, where possible the hospital is being asked to supply the immediate staff. This may be possible in six out of nine units. The arrangement is complete in two cases, and in one of these it has been found necessary to increase the resident staff of the hospital by three persons to make it possible for them to fulfil the new obligation.

It is only fair to say that many of these arrangements are in their early stages. A considerable amount of negotiation is necessary to enable such changes to be made. Up to the present, however, the proposed alterations have been received very favourably by doctors and nurses in the scheme; so much so that one cannot help feeling that the hospital should from the very first have been made the basic unit.—I am, etc.,

FRASER BROCKINGTON,
Jan. 1. Deputy County Medical Officer of Health, Warwickshire County Council.

Specialists in the Services

SIR,—At the outbreak of war a number of specialists were called up and trained in Service methods, with which many of them had been previously unfamiliar. These officers now remain in the full pay of the units to which they are attached, but because of the absence of casualties are unemployed according to their professional qualifications and instead carry out routine work—for example, that of orderly officer. This is the position as regards two hospital surgeons known to us and probably applies to very many others. Each of these officers is a surgical specialist—in the one case in the Army; in the other in the Royal Air Force. One has not performed an operation since his calling up at the end of August, and the other has dealt with a very few surgical cases. Both are in this country and could be well employed at the general hospital on the staff of which they serve in civil life.

It is suggested that it would be in the interests of the community if they were seconded from the Service to carry on their civilian work, not only because the general public would benefit from their services, but also because as surgeons it is very desirable for these officers to be practising surgery. They could of course be recalled at twenty-four hours' notice if and when their services are required as surgical specialists. As we are given to understand that all three Services have waiting lists of medical volunteers, others could be appointed in the place of specialists to act as orderly officers, etc. Such additions would increase the number of medical officers trained in Service methods. If the suggestion is followed of, so far as possible, seconding specialists when they are trained in Service routine, the numbers of trained medical officers will be increased while the general public will have the services, at least for the time being, of specialists who are otherwise merely standing by and of necessity undergoing disuse atrophy.—We are, etc.,

J. BERRY HAYCRAFT.
Cardiff, Jan. 4. LAMBERT ROGERS.

Ophthalmic Injuries from Mustard Gas

SIR,—I would be obliged if you could allow me to make certain additions and corrections to my article (*Journal*, December 16, 1939, p. 1181) on the effect of mustard gas on the eyes. The dilution of milton advised by the makers is equivalent to 1 part in 192 (not 152) of water. The chlorine atoms in the structural formula of AA-dichlorethylsulphide should be linked to methyl groups. The words "sulphone" and "sulphoxide" should be reversed in position. The sulphone produced by oxidation of the sulphoxide is the more irritating of the two substances, being almost as vesicant as mustard gas itself. As a solid, however, it is less obtrusive.

I am obliged to Mr. Arnold Sorsby (December 23, p. 1250) for drawing attention to Colonel L. T. Poole's work as a basis for his statements. Colonel Poole was kind enough to let me have a copy of his paper prior to the publication of my article; it was, however, too late at that time to make any alterations in the proof. This paper, "Chemical Warfare in Relation to Ophthalmology," is as yet unpublished, and as I feel I did not justify my suggestion that further experiments with known reagents in the treatment of the stage of impregnation might have fruitful results, I should like to draw attention to one of his statements again.

Colonel Poole says that if drops of the liquid mustard gas are simultaneously placed on the cornea of both eyes of an animal, and one eye is immediately thoroughly irrigated while the other is left untouched, the lesions evidenced in both eyes when examined microscopically the next day are indistinguishable from each other. Warthin finds that exposure of a rabbit's eye to 1 in 20,000 of mustard gas in air, or the insertion of a droplet of 0.004 c.cm. (which is equivalent), causes a burn so intense that the eye is disorganized within six weeks unless the lids are separated by irrigating. It would seem, therefore, that Colonel Poole's statement refers only to burns of the most severe type. On the other hand, the majority of the eye burns in the last war were much less severe, and the droplets found in a cloud of vapour vary in size between one-thousandth and one-millionth of a centimetre. It was for this reason, therefore, that I suggested further research might be productive of useful information. Even if we accept Colonel Poole's results as incontrovertible (and I do), it may be argued that the vapour from spray or bombs will be more concentrated than in the last war. On the other hand, the houses, gas-masks, and better knowledge of the action of mustard gas may protect the city population at least far more than the measures adopted for the troops in the trenches in the last war, and the ratios of the different classes of case may remain unaltered.

Since I wrote this paper other antidotal substances for the stage of impregnation have been brought to my notice. Among other possible agents for oxidation of mustard gas are: (1) potassium chlorate gr. 10 to the ounce, which has been used in cases of ophthalmia neonatorum; (2) hydrogen peroxide in varying forms. The latter substance has been used as 10 vol. peroxide at a dilution of 1 in 4, as sodium perborate ($NaBo_4H_2O$) in a strength of 1 to 2 per cent., and as a 3 per cent. solution of "ortizon" (Bayer). The latter is a molecular compound of urea and hydrogen peroxide stabilized by citric acid, and like the other compounds of hydrogen peroxide quoted above has been used in the treatment of conjunctivitis and blepharitis.

I have no other information about the chemical reaction with potassium chlorate, but Dr. F. G. Mann (an authority on the oxidation of the lewisites) informs me that at body temperature it is unlikely that hydrogen peroxide would oxidize mustard gas. At the same time the experiment, he says, has not been tried. As the corneal epithelium burnt by mustard gas necroses at the end of sixteen hours, and may contain a little mustard gas then, it is possible that peroxide solutions might have a use in getting rid of this dead infected epithelium.

Pituitary extract was quoted in correspondence in the *Journal* as being part of the German ophthalmic treatment. Its action would depend, presumably, upon the vasoconstrictor fraction (pitressin), which is made up commercially with 3 per cent. acetic acid. Parke, Davis and Co. were kind enough to give me some of their pitressin in ampoules for experiments, and suggested that it be used at a *p*H of approximately 7.4 by neutralizing with sodium bicarbonate, and that 0.4 per cent. of chloretone be introduced as a preservative. So far I have not noticed any marked vasoconstrictor effect in the cases of conjunctivitis and corneal ulceration on which I have employed it. Owing to the Christmas period, however, I have only been able to experiment with a few cases.

I am also informed that the quantitative estimation of mustard gas, of total chlorides, as I suggested in my paper, is not practical. There is, in fact, no good quantitative test for mustard gas; the nearest approach being the so-called "gold chloride test," which is not very satisfactory.

Finally, if a wide-scale experiment is contemplated in practice a 1 in 150 aqueous solution of chloramine-T seems, on examination of the possibilities, to be the substance which would probably be most effective in the treatment of the stage of impregnation. If produced in large quantities its price (7s. 6d. a lb.) can be considerably lowered below the present commercial quotation.—I am, etc.,

Leeds, Dec. 30, 1939. JOHN FOSTER, F.R.C.S.

Maternal Mortality for 1938

SIR,—May I, with due diffidence, be permitted to refer to your note in the *Journal* of January 6 (p. 29) regarding the maternal mortality of Leeds, which reads, "The most noteworthy achievement was the fall of the maternal mortality rate to the low figure of 1.76 per 1,000 births—the lowest for any of the large towns of England and Wales." According to the *Annual Report* of the Chief Medical Officer of the Ministry of Health (p. 216) there would appear to be seven county boroughs with a maternal mortality less than Leeds—namely:

	Maternal Mortality
Preston	1.63 per 1,000
Derby	1.46 " "
Burton-on-Trent	1.44 " "
Bournemouth	1.42 " "
Ipswich	1.32 " "
Exeter	0.95 " "
Croydon	0.87 " "

The report gives the maternal mortality for Leeds as 1.77 per 1,000 (not 1.76, as stated in the *Journal*). This figure is the same as for Nottingham. It is not clear what standard of population constitutes a large town. If we take the figure of 200,000 as the standard Leeds would take second place with Nottingham. The honour of having the lowest maternal mortality for 1938 belongs to Croydon.—I am, etc.,

Croydon, Jan. 6. RUFUS C. THOMAS.

Vitamin K Therapy in Obstructive Jaundice

SIR,—In their paper published in your issue of December 23, 1939 (p. 1220), Macfie, Bacharach, and Chance have presented convincing evidence of the action of intramuscular injections of 2-methyl-1:4-naphthoquinone in rapidly restoring plasma prothrombin to normal, and so preventing or controlling haemorrhage after operation in cases of obstructive jaundice where hypoprothrombinaemia is present. In view of the immediate effect of this form of treatment it is clearly the method of choice in those patients subjected to operation without adequate preparation and in whom bleeding has already occurred and where oral therapy is impossible because of vomiting. On the other hand, oral administration of bile salts, together with a diet rich in vitamin K or supplemented with preparations of the vitamin, is effective in restoring the plasma prothrombin to normal, often in less than a week, and this method of treatment is suitable as a pre-operative preparation of the patient.

Success with such measures has now been reported by many authors. In recent months patients have been treated at the Royal Victoria Infirmary, Newcastle-upon-Tyne, with bile salts (bilron Lilly, 2 capsules t.d.s.) and a diet high in carbohydrate and rich in vitamin K. In two cases in which the level of plasma prothrombin before treatment was 31 per cent. and 68 per cent. of normal the level rose to normal after seven days. As tests were not made at shorter intervals the response may in fact have occurred earlier. The prothrombin estimations were made by Dr. Freda Herbert, using a modification of the method of Warner, Brinkhous, and Smith. (This technique is still under investigation in the hope of greater simplicity being achieved without loss of accuracy.) In addition to the restoration to normal of the prothrombin, these and other patients with obstructive jaundice who were given bile salts showed marked improvement in appetite and general sense of well-being; their anaemia also improved, as shown by blood examination.—We are, etc.,

GEORGE Y. FEGGETTER.
Newcastle-upon-Tyne, Jan. 3. J. POTTER.

2-Methyl-1 : 4-Naphthoquinone

SIR,—Fernholz and Ansbacher, in a communication to the editor of *Science* published on September 1 (1939, **90**, 215), expressed the view that the vitamin K activity of phthiocol is very probably due to its contamination with 2-methyl-1 : 4-naphthoquinone. They also stated that clinical trials with this synthetic compound were in hand and appeared to be giving good results. In a paper published in this *Journal* in December (Macfie *et al.*, *British Medical Journal*, 1939, **2**, 1220) by two other authors and myself no reference was made to this first mention of the therapeutic use of methyl-naphthoquinone. Although that mention was incidental and almost casual, it must go on record as the first, and we wish to take this opportunity of acknowledging the fact. Unfortunately, owing to the present abnormal conditions, the particular issue of *Science* in which Fernholz and Ansbacher's paper appeared had not been seen by us when we passed the proofs of our paper.

May I take this opportunity of also correcting a small error in the paper by Macfie, Chance, and myself (loc. cit.). Describing the method of obtaining blood from the chicken's heart, in the third paragraph of the second column of page 1220, we state that the syringe needle full of blood should be allowed to *stand* for a few seconds. The word "standing" should read "spinning"; this is needed for proper mixing of the sample.

Greenford, Middlesex, Jan. 3. A. L. BACHARACH.

Vitamin Content of Margarine

SIR,—During the last few weeks many of us who are general practitioners have had the subject of margarine brought frequently to our notice. Patients who are on special diets for various diseases have been asking for certificates to enable them to obtain an extra supply of butter. The Government has now relieved us of the responsibility of issuing these, and we are left wondering if any of them were really necessary.

We are given to understand that the calorie value of margarine is equal to that of butter; are we entitled to inform our patients that it is equal in digestibility and in ease of assimilation also? Recently I have had the opportunity of discussing the subject with several people concerned with the manufacture of margarine. All are enthusiastic, I believe rightly so, on the improvements which have taken place since the last war in its flavour, purity, and freedom from handling. As regards added vitamin concentrates, information as to their ingredients and potency is not easy to obtain.

As this question of vitamins in margarine is likely in a long war to assume vital importance for the future of our race, I am sure we should feel happier if we knew that the Government had made arrangements for samples of margarine to be tested periodically with a view to ensuring that it contains vitamins in quantities equal to the content of butter. Can you, Sir, or any of your readers supply answers to these questions?—I am, etc.,

West Kirby, Jan. 1. PAUL B. PINKERTON, M.B.

Relapses after Sulphonamide for Gonorrhoea

SIR,—Much correspondence has appeared in your columns as a result of the recent article by Mr. A. J. Cokkinis and Dr. G. L. M. McElligott (*Journal*, December 2, 1939, p. 1080), who report a considerable relapse rate from the sulphonamide treatment of gonorrhoea. The importance of differentiating between a consideration of the success of sulphonamide therapy and the value of sulphonamides in gonorrhoea has not always been apparent. No one with any experience of the disease in the pre-sulphonamide days would deny the immense progress in the treatment of gonorrhoea since the sulphonamides, and particularly sulphapyridine, have been available. If on the first attendance careful instructions are given on drug symptoms and the need for further treatment after apparent cure, the defaulter rate does not create a problem which can detract from the value of these drugs as a routine treatment.

It is difficult to obtain reliable information in assessing relapses; some patients fear being ridiculed in admitting further exposure to infection, as can be illustrated by a recent patient who asserted his innocence for one month and then confided that he had been exposed to infection a few days before re-attending. Apart from full and prolonged testing of apparent cures, the necessity for adjuvant local treatment with irrigations, the choice of the most efficacious sulphonamide compound in its optimum dosage, and its employment at once to prevent the spread of the disease to regions from which eradication is difficult are factors which probably have an important bearing on the success of treatment. They may perhaps explain the more satisfactory results experienced at some clinics, but the results would have been more easily compared if Mr. Cokkinis and Dr. McElligott had reported on only those cases in which gonococci had been demonstrated at the outset.—I am, etc.,

London, W.1, Jan. 1. DAVID ERSKINE.

Diphtheria Prophylaxis

SIR,—At the Aberdeen Meeting, quoting Ramon, Sir John Ledingham stated that "it is only when the proportion of vaccinated children reaches 70 or 80 per cent. that one sees the real fruits of one's work." To attain this result reactions must necessarily be reduced to a minimum, as the consent of parents to inoculation will vary inversely with their number and severity. Much as I should like to employ the two-shot method with A.P.T. so strongly recommended by Dr. J. Tudor Lewis in your issue of December 23, 1939 (p. 1226), I am afraid that even a proportion of forty-three reactions (eight of them severe) in 1,082 would affect adversely any immunization scheme.

That a percentage of inoculated children greater than the above has been attained in my own district I attribute solely to the preparations used. During the last three years 582 children have been inoculated—390 with T.A.M. and 192 with T.A.F., three doses each child. On no occasion has a message been received to see any of these children after inoculation with either preparation, and on no occasion was a further dose refused. In five instances slight swellings and redness were noticed with T.A.M. when the child appeared for a further dose, but there was a complete absence of any serious reaction either local or general, and with T.A.F. there has been no reaction whatsoever.—I am, etc.,

Aysgarth, Dec. 31, 1939. W. N. PICKLES.

Treatment of Haemorrhoids

SIR,—I read Mr. W. B. Gabriel's paper on this subject in the *Journal* of December 30, 1939 (p. 1266) with great interest and advantage. At the risk of being tedious, however, I cannot refrain from writing to express some differences of opinion with him upon the question of the selection of cases for treatment by means of injection and upon one or two more minor points.

Since I first practised the treatment of internal haemorrhoids by means of injection at the beginning of 1915 I have found that really very few cases of haemorrhoids are unsuitable for this method. Consequently I entirely disagree with Mr. Gabriel when he writes that third-degree piles—that is, those in which prolapse is no longer spontaneously reducible—should always be subjected to operation. It is in just that type of case that I have had my most striking and pleasing success. I have had literally hundreds of cases in which the haemorrhoids have been so constantly "down" that the patients have worn protective pads for years past in order to protect their clothes from the blood-stained discharge from their prolapsed haemorrhoids but in which the prolapse has ceased immediately after the first injection. The great majority of these patients have remained well for a very great number of years. Indeed, I still hear from some whom I treated over twenty years ago who have had no sign of recurrence. In my book on haemorrhoids, which was first published in 1923, I gave statistics of recurrences in a consecutive series of cases treated over

three years previously. The recurrence rate in that series worked out at 16.6 per cent. It is very likely that with the newer operation described by Mr. Gabriel recurrences are infrequent. I can say, however, that up to a very recent date I have seen numerous patients who have suffered relapse after operations on their haemorrhoids even at the hands of experts, and these cases have done perfectly well and had no further relapse after their subsequent treatment by injection. After all, if one tells a patient—as one can do truthfully—that if he has his piles treated by injection he will have a four-to-one chance of having no recurrence, most of them will greatly prefer to take that chance rather than to go into a hospital or nursing home for ten to fourteen days and undergo all the discomforts which even the modern operation entails.

Mr. Gabriel writes further that haemorrhoids complicated by fissure are unsuitable for injection. I, too, used to be of that opinion, until Mr. Gabriel himself described the treatment of fissure by injection of "A.B.A.," which treatment was later improved upon by the introduction of proctocaine injections. Since that time I have found that most cases of fissure can be treated at once by injection of one or other of these solutions, after which one can proceed at the same sitting to introduce a speculum and to inject the piles. Nor, in my opinion, does a fibrous polypus prevent ambulatory treatment by means of injection. It is usually easy to hook out the polyp with one's finger, inject its pedicle with novocain or proctocaine, and then to ligature the pedicle and remove the polyp. The haemorrhoids can be injected at the same sitting or at subsequent ones.

My experience differs from that of Mr. Gabriel again as regards occupation. I have not found strenuous occupations any bar to treatment by injection. Some of my patients have continued to play polo; others have gone on rowing in regattas, and others have had strenuous occupations. In none of them have their activities been interrupted by the treatment.

My technique differs from Mr. Gabriel's in some minor details. I always use nowadays a 5 per cent. solution of phenol in almond oil. The solution introduced by Albright was in "Wesson oil," which is not easily procurable in this country. I myself was the first in Great Britain to introduce the use of almond oil in 1928. I have found that the addition of menthol, as in Albright's solution, has no advantages, and that it sometimes gives rise to unpleasant side-effects. I ceased using it many years ago. I find it much better, wherever possible, to inject all the piles at each treatment—not only the three primary piles, but the secondary ones also. I find that on an average five treatments are required, and I believe that many of the recurrences after the treatment has been employed by others have occurred mainly because an insufficient number of injections have been given.

I should very much like Mr. Gabriel to reconsider his dicta about the choice of cases for injection. If he would try it in some unselected third-degree cases and would give at least five weekly injections into every pile he would find that the recurrence rate is really quite low, and that his patients would be even more grateful to him than if he had cured them by operation.—I am, etc.,

London, W.1, Dec. 31, 1939. ARTHUR S. MORLEY.

Diurnal Enuresis

SIR,—Dr. Doris M. Odlum's interesting article on nocturnal enuresis (*Journal*, January 6, p. 8) contains one statement which I think needs correcting.

It is not, I think, true that diurnal incontinence "after the age of 5 years must definitely be regarded as deliberate naughtiness." The case which I have in mind at present is one in which a child of 7 years does wet himself during the day and does so sometimes saying, "Watch me wee in my trousers." This might easily be taken as a symptom of naughtiness, but more careful investigation shows that it is not so at all, but rather reveals his undeveloped emotional state. This is particularly clear not only from investigation of the child himself but also from the history, which is a very bad one: it is one of a child whose difficulties started soon after birth and have continued ever since without remission.

Later in her article Dr. Odlum remarks, "A magic is greatly needed, but, alas! no magic is available," and though this statement is evidently meant humorously yet it strikes right at the centre of the problem. Enuresis is one of the symptoms upon which medicine has centred its magic, unfortunately for the children, who are as a result deprived of a symptom which they often need. What is wanted is not a magic but a real attempt to appreciate the deep meaning of the symptom in relation to the child himself and his family as a whole, otherwise I would suggest as much harm as good can be done by centring attention on the symptom alone, even if as the result of this attention the symptom is cured.—I am, etc.,

London, N.W.3, Jan. 5. MICHAEL FORDHAM, M.R.C.P.

Nomenclature of Blood Groups

SIR,—As the British member of the Health Committee of the League of Nations, I have been asked to draw your attention to the following resolution passed at the meeting of this committee on November 20–25, 1939:

> "The Health Committee believes it to be its duty once more to draw the attention of all concerned to the recommendation adopted by the Permanent Commission on Biological Standardization in 1928 concerning the nomenclature to be adopted in the designation of blood groups. It is of opinion that, especially in present circumstances, the use of a uniform nomenclature will obviate mistakes which might entail serious consequences."

In 1928 the Permanent Commission on Biological Standardization reported that:

> "The Commission learns with satisfaction that, on the initiative of the Health Organization of the League of Nations, the nomenclature proposed by von Dungern and Hirszfeld for the classification of blood groups has been generally accepted, and recommends that this nomenclature shall be adopted for international use as follows: O A B AB. To facilitate the change from the nomenclature hitherto employed the following is suggested:
>
> | | | | | |
> |---|---|---|---|---|
> | Jansky ..... | O(I) | A(II) | B(III) | AB(IV) |
> | Moss ..... | O(IV) | A(II) | B(III) | AB(I) |
>
> The Commission recommends the adoption of the following method of designating test sera: Test-serum A (anti-B); test-serum B (anti-A). Test-serum A (anti-B) should be placed in containers of white glass, test-serum B (anti-A) in containers of brown glass.
>
> The Commission, having learned that in certain countries this nomenclature was not yet in current use, emphasized the importance of achieving uniformity in the matter. The Commission believes that this object might be attained (*a*) if each institute which supplies standard sera used solely this nomenclature; (*b*) if the editors of scientific journals (medical, legal, etc.) insisted upon the exclusive use of this nomenclature in all the works they may be called upon to publish. It is particularly desirable that all the more important weekly medical journals should also conform to this rule."

The attention of the Health Committee had been drawn to the question by the Danish member, who stated that authoritative British medical journals had recently published articles in which the old nomenclature had been used.—I am, etc.,

NEVILLE M. GOODMAN.

Ministry of Health, Whitehall, S.W.1, Jan. 9.

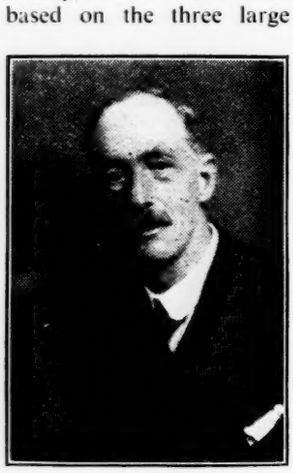
Oestrin Excretion of Psychotics.—Previous assays of oestrin in the urine of female schizophrenics have indicated either a diminution or a complete absence of the ovarian hormone. Assays of the oestrin in the urine of seven psychotic patients are reported. The oestrin excretion curves, as well as the total monthly excretion of oestrin, both free and bound, fall within normal limits in all cases.—Oestrin Excretion in Psychotic Patients. J. Lansbury and J. Hughes.—*Amer. J. Psychiat.*, March, 1939, **95**, 1119.

Obituary

JOHN MIDDLETON MARTIN, M.D.

Late County M.O.H. for Gloucestershire

Dr. J. Middleton Martin, for thirty-five years medical officer of health to the Gloucestershire County Council, died at his home in Cheltenham on December 30, 1939. During that period he was responsible for introducing many schemes which it was his function to translate into action. This creative touch was nowhere more apparent or more happy in its results than in his scheme for the extension and co-ordination of the medical practice of his county, with its chain of services covering the whole area, based on the three large general hospitals at Bristol, Cheltenham, and Gloucester. The scheme in its inception was recognized as a model by the Consultative Council on Medical and Allied Services set up by the first Minister of Health, with Lord Dawson of Penn as its chairman.



Born in August, 1870, John Middleton Martin was the third son of the late John May Martin, of Exeter. From Exeter School he went to Peterhouse, Cambridge, with a scholarship, and gained first-class honours in the Natural Sciences Tripos of 1893. He continued his medical studies in London at University College Hospital, where he won gold medals in medicine and surgery. He graduated M.B., B.Ch. in 1897, took the D.P.H. in 1899, and proceeded M.D. in 1903. His long connexion with public health administration in Gloucestershire began in 1901 as M.O.H. to the Stroud Urban and Rural District Councils and medical superintendent of the joint isolation hospital. Middleton Martin's appointment as the first M.O.H. for the county was on a part-time basis, and it was not until this basis was altered that he gave up his official posts in the Stroud district. On the passing of the Midwives Act in 1902 he became executive officer for the county, and it was largely through his efforts that this service reached a high level of efficiency. So, too, his work as school medical officer for the county was of the utmost value. The coming into force of the National Insurance Act gave him the task of bringing the scheme into operation, and during the war of 1914–18 there came the extension of the personal aspect of public health services, which included the initiation of maternity and child welfare work, health visiting, and the treatment of venereal disease. It was in 1920 that he worked out a scheme for diagnosis and treatment in outstations by the extension of the medical services to all parts of the county, and thus became a pioneer of organized medicine in Britain, bringing together the medical practitioners, the hospitals, and the local authorities in a common cause. Throughout his career Middleton Martin was deeply interested in the control of tuberculosis, and it was only on February 4, 1939, that he published in the *British Medical Journal* a paper entitled "Tuberculosis: Dogmas and Doubts of Sixty Years." Twelve months before that, in his farewell report as M.O.H. for Gloucestershire, he reviewed half a century of public health services in the county. He was an indefatigable worker, with a natural gift for statistics, simple in his personal requirements and content to carry on in makeshift offices with a very limited staff. Had he been ambitious of personal advancement he might have sought even wider scope for his remarkable power of organization.

Middleton Martin had a fine record of service in the British Medical Association, which he joined in 1897. Much of this work was done during the past twelve years at headquarters; but he also held office as President of the Gloucestershire Branch in 1924–5, and was its Representative at the Annual Meetings of the Association from 1926 to 1936. He was a member of the Private Practice Committee and the General Medical Service Scheme Committee in 1928–30, of the Organization Committee for nine years, and of the Public Health Committee for nearly as long. He became a member of the Journal Committee for a year and of the Central Council for four years, and served on a number of special committees and subcommittees meeting in London; at the Annual Meeting in Manchester in 1929 he was vice-president of the Section of Public Health.

A colleague in the Gloucestershire Branch writes:

The death of Dr. J. Middleton Martin, only two years after his retirement from the post of county medical officer of health, is a very great loss to the profession which he was continuing to serve. He was overflowing with nervous energy, and had such a high standard of duty in everything he undertook that he expended himself lavishly. The qualities which impressed those who best knew him were his conscientiousness, his scrupulous honesty both with himself and others, and his unfailing kindliness. He was the staunchest of friends. His mind was keen, finely tempered, and fastidious. He was highly sensitive, a fact not generally recognized, and to a public official that may prove a burden. His transparent honesty of purpose brought him full appreciation, and he became the wise counsellor and trusted friend of the whole profession in Gloucestershire, where his influence was very great. He leaves a place that one feels can never be filled.

[The photograph reproduced is by Elliott and Fry, Ltd.]

A. HUBERT WATSON, M.D., B.CH.

Senior Surgeon, Salisbury General Infirmary

We regret to announce that Dr. Arthur Hubert Watson, senior honorary surgeon to the Salisbury General Infirmary, died on January 3 from a fractured skull sustained in a fall on the ice when skating.

A native of Northern Ireland, he was born at Charlemont, County Armagh, on September 8, 1890, the third son of the Rev. John Watson, and from Dungannon Royal School entered Trinity College, Dublin, where he graduated in medicine in 1915 after taking the B.A. two years earlier. Immediately on qualification he joined the R.A.M.C. and served for three years in France and Egypt; after the war he proceeded to the M.D. degree and became in turn resident medical officer at the Royal Mineral Water Hospital, Bath, and senior house-surgeon at the Warneford Hospital, Leamington. In 1920 he went to practise at Salisbury, combining surgical work with that of a general practitioner, and specializing in diseases of the ear, nose, and throat. He was quickly appointed to the visiting staff of the Salisbury General Infirmary, at first as assistant honorary surgeon and latterly as honorary surgeon. He had also been in charge of the ear, nose, and throat department since 1921. His skill, devotion to duty, and charm of manner endeared him to all.

Dr. Watson served as a member of the Representative Body of the British Medical Association in 1937, was

elected chairman of the Salisbury Division in May, 1938, and president of the Wiltshire Branch six months later. At a meeting of the local Division a few weeks ago, when retiring from the chairmanship, he gave an able lecture on the modern treatment of war wounds. He was also an active member of the Salisbury Medical War Committee. He leaves a widow and two children.

A colleague writes: Hubert Watson was a large-hearted, generous Irishman of outstanding ability who had earned the warm regard of his professional colleagues and the affectionate esteem of his patients both hospital and private. I was in Salisbury yesterday; the whole city seemed to be permeated with sorrow at his loss—in the shops, in the streets, at the recruiting board, and especially at the Infirmary the sudden death of everyone's friend was the dominant thought. Only recently he decided to give up all general practice and devote himself to surgery only; there is not the slightest doubt that he had a great career in front of him, especially if his colleagues had had their way and persuaded him to abandon his altruistic and ultra-patriotic decision to offer his services to the fighting forces.

Dr. VIGGO CHRISTIANSEN, emeritus professor of neurology in the Copenhagen medical faculty and president last April at the International Neurological Congress held at Copenhagen, has died at the age of 71. He was Corresponding Member of the Académie de Médecine of Paris, Foreign Corresponding Member of the British Medical Association, honorary member of the Section of Neurology of the Royal Society of Medicine, and Commander of the Order of Leopold of Belgium. The deaths are reported also of Dr. LÉON GODTS, director of the Health Service of the Belgian Army in England during the last war; Dr. OSCAR BERNHARD of St. Moritz, a pioneer in the heliotherapy of surgical diseases and honorary doctor of the Universities of Frankfort and Berne; Dr. LIVINGSTON FARRAND, president emeritus of Columbia College, New York, author of *Basis of American History*, and former editor of the *American Journal of Public Health*, aged 72; and Dr. GUILLERMO ARANA, professor of operative surgery in the Buenos Aires medical faculty, aged 54, founder and first president of the Society of Argentine Surgeons and author of several surgical works. Mlle MARTHA L. CONDAT, professor of clinical paediatrics in the Toulouse medical faculty, and the first French woman doctor to reach so high a position, has recently died, aged 51.

The Services

COLONEL COMMANDANT, R.A.M.C.

Lieutenant-General Sir Harold B. Fawcus, K.C.B., C.M.G., D.S.O., has been appointed Colonel Commandant, Royal Army Medical Corps, for the year 1940.

HONORARY PHYSICIAN TO THE KING

Surgeon Captain T. B. Dixon, V.D., R.N.V.R., has been appointed Honorary Physician to the King in succession to Surgeon Captain L. S. Ashcroft, V.D., R.N.V.R.

HONORARY SURGEONS TO THE VICEROY

Colonels H. Stott, O.B.E., I.M.S., E. S. Phipson, C.I.E., D.S.O., I.M.S., and F. F. S. Smith, I.M.S., have been appointed Honorary Surgeons to the Viceroy and Governor-General of India.

NAVAL AWARDS

It was announced in a Supplement to the *London Gazette*, published on January 1, that the King has approved the following awards: The O.B.E. (Military Division) (Additional) to Surgeon Commander Malcolm Andrew Graham-Yooll, H.M.S. *Adventure*, and Surgeon Lieutenant Henry Gordon Silvester, H.M.S. *Jersey*, "for undaunted courage, steadfastness, coolness and resource in saving ships and life at sea, in the face of peril and adversity," and the D.S.C. to Surgeon Lieutenant Vincent Joseph Redmond Sheridan, R.N., "for services in the Sino-Japanese conflict."

MENTIONS IN DISPATCHES: OPERATIONS IN PALESTINE AND TRANSJORDAN

The names of Lieutenant-Colonel N. Cameron, R.A.M.C., and Captain G. M. Robertshaw, R.A.M.C., have been brought to notice by the General Officer Commanding the British Forces in Palestine and Transjordan in recognition of distinguished services rendered in connexion with the operations in Palestine during the period April 1 to July 30, 1939.

DEATHS IN THE SERVICES

Colonel HENRY MCKENZIE ADAMSON, C.B., late R.A.M.C., died at Montrose on December 23, 1939, aged 78. He was born at St. Cyrus, Kincardineshire, on November 26, 1861, and was educated at the University of Aberdeen, where he graduated M.B., C.M. in 1884. He entered the army as surgeon on January 30, 1886, became lieutenant-colonel after twenty years' service, colonel in the long war promotion list of March 1, 1915, and retired on November 26, 1918. He had a long list of war service: Burma, 1887–9, Indian Frontier medal with clasp; Sudan war of 1898, battles of Atbara and Khartoum, twice mentioned in dispatches, medal, and Egyptian medal with two clasps; war of 1914–18, mentioned in dispatches, and received the C.B.

Universities and Colleges

UNIVERSITY OF LONDON

The following candidates have been approved at the examinations indicated:

M.D.—*Branch I (Medicine)*: H. I. C. Balfour, K. P. Ball, A. C. Dornhurst, D. L. H. Goddard, G. B. Hollings, J. Ketcher, K. J. Mann. *Branch II (Pathology)*: Barbara M. Hope. *Branch III (Psychological Medicine)*: A. S. Thorley. *Branch IV (Midwifery and Diseases of Women)*: Dorothy S. Pope. *Branch V (Hygiene)*: C. W. Dixon, H. A. Leggett.

M.S.—*Branch IV (Oto-rhino-laryngology)*: B. M. Fonseka.

ACADEMIC POSTGRADUATE DIPLOMA IN MEDICAL RADIOLOGY.—S. H. Ali, N. Sacks.

ROYAL COLLEGE OF SURGEONS OF ENGLAND

The course of lectures for 1940 is arranged as follows: January 19, Mr. Digby Chamberlain, Treatment of stone in the common bile duct; January 22, Mr. Rainsford Mowlem, Use and behaviour of cartilage and bone transplants; January 24, Mr. Hermon Taylor, Practical evaluation of gastroscopy; January 26, Mr. E. C. B. Butler, Observations on the treatment, complications, and late results of acute haematogenous osteomyelitis, based on a study of 500 cases admitted to the London Hospital during the years 1919–37; January 29, Mr. A. H. McIndoe, Inlay grafting, with special reference to obliterative conditions of the vagina; January 31, Mr. Cecil P. G. Wakeley, Treatment of certain types of external herniae; February 2, Mr. D. Ll. Griffiths, Volkmann's ischaemic contracture; February 5, Mr. F. F. Rundle, The role of the liver in thyrotoxicosis; February 7, Mr. Kenneth C. Eden, Dumb-bell tumours and neurofibromatosis of the spine, with special reference to bone changes; February 12, Mr. Michael Oldfield, The anatomy and physiology of speech, with especial reference to the treatment of cleft palate; February 19, Dr. S. A. Henry, Cancer of the scrotum in relation to occupation. All the above lectures begin at 3 p.m.

Primary Fellowship Examination

The following have been successful at the First Professional Examination for the Diploma of Fellow:

E. W. O. Adkins, M.B., B.Chir., M.R.C.S., W. H. Bond, G. Brosnan, M.B., B.S., J. G. Brown, M.B., M.S., W. N. Campbell, M.B., Ch.B., F. W. Connaughton, M.B., B.S., D. J. Dawson, M.B., Ch.B., H. E. H. Denham, M.B., Ch.B., G. F. Dommisse, M.B., Ch.B., P. D. Eeman, D. T. H. Evans, M.R.C.S., J. C. Fulford, L. Gillis, M.B., B.Ch., J. R. Grimoldby, M.B., Ch.B., G. St. J. Hallett, M.B., B.Chir., M.R.C.S., C. G. D. Halstead, M.B., Ch.B., W. Hewitt, H. N. G. Hudson, M.B., B.S., M.R.C.S., H. D. Johnson, M.B., B.Chir., M.R.C.S., T. D. Kelly, M.B., B.S., A. E. Kingston, M.R.C.S., H. Lal, M.B., B.S., H. E. Lockhart-Mummery, R. Marcus, M.B., Ch.B., J. R. Pandya, M.B., B.S., H. G. Patel, M.B., B.S., W. L. Phillips, M.B., Ch.B., C. R. Rapp, M.D., Kathleen M. Robinson, M.B., B.S., M.R.C.S., P. M. G. Russell, M.B., B.S., M.R.C.S., M. H. M. Ryan, M.B., B.S., M. F. Sayed, M.B., B.Ch., S. F. Taylor, B.M., B.Ch., M.R.C.S., L. C. Thomson, M.B., B.S., M.R.C.S., J. V. Todd, M.B., B.S., J. F. N. C. Ward-McQuaid, K. W. Wilkinson.

Medical News

The twenty-second Silvanus Thompson Memorial Lecture, on "The Irradiation of Liquids," will be delivered by Professor F. L. Hopwood, D.Sc., and the twentieth Mackenzie Davidson Memorial Lecture by Dr. L. A. Rowden on "Maternal Mortality and Radiology," before the British Institute of Radiology, 32, Welbeck Street, W., on Friday, January 19, at 2 p.m.

The fifth of the series of free public addresses entitled "The Deeper Causes of the War and the Issues Involved" will be given by Sir Richard Livingstone, LL.D., in the Assembly Hall (entrance in Craven Street, Strand) of the Royal Empire Society, at 2 p.m. on Thursday, January 18. Subject: "The Crisis of Civilization."

An exhibition of contemporary British painting, drawing, and sculpture opened at Burlington House, London, on January 5 and will continue until March 9. It has been organized by the Royal Academy in co-operation with twenty-four other art societies, and the works exhibited are by the members of these societies and artists recommended by them. All the works, of which there are over 2,000 contributed by some 1,250 artists, are for sale, and half the price paid on each sale will be divided equally between the Lord Mayor's Red Cross and St. John Fund and the Artists' and General Benevolent Institution. The exhibition affords an unprecedented opportunity of judging the merits of different schools and widely differing personal qualities and styles. It is a friendly show, not to be missed in these times for many reasons, but none so much as for the charitable purpose it is to serve.

The first South American Congress of Oto-rhino-laryngology will be held at Buenos Aires in April, 1940, under the presidency of Professor Elisco V. Segure. Further information may be obtained from the secretariat, Rue Montevideo 696, Buenos Aires.

At a meeting of the Committee for the Study of Medical Hydrology in Great Britain, held on December 20, it was decided to carry on its work of providing lectures to medical societies on clinical aspects of hydrological treatment with redoubled vigour in view of the great value of such treatment in both rehabilitation and nervous cases. The value of such treatment was well demonstrated in and after the last war, and it is on this aspect that it wishes to lay particular stress. It is realized that "black-out" makes the attendance of evening meetings difficult, and it was suggested that, where possible, meetings and lectures should be held in the late spring and summer to take the place of some of those that would ordinarily be held in the winter. The hon. secretary of the committee is Dr. G. D. Kersley, 6, The Circus, Bath.

EPIDEMIOLOGICAL NOTES

Infectious Diseases for the Week

Of the prevalent notifiable diseases only measles and pneumonia (primary and influenzal) have increased in England and Wales during the week, the former from 2,225 to 2,248 and the latter from 440 to 450. The expected measles epidemic is developing slowly and irregularly; with a few exceptions rural and urban areas so far have been affected more than large cities and boroughs. Despite the recent prevalence of influenza, notifications of pneumonia (primary and influenzal) and the number of deaths from influenza have shown but little change. Uncomplicated influenza is not notifiable, and official records are therefore only available when pneumonia has supervened or when attacks are severe and suggest the probability of pneumonia. The current form of influenza is comparatively mild in its effects, although the initial symptoms may be alarming. The onset is characteristically sudden, with shivering or rigors, fever (101° to 103° F.), malaise and general pains, and in some instances delirium. Catarrhal and gastric features are inconspicuous or absent and defervescence is rapid, usually in twenty-four to forty-eight hours. Nervous or pulmonary sequels are rare, except in those prone to them by reason of age or previous health.

In Scotland diphtheria declined considerably and scarlet fever slightly, while primary pneumonia increased in incidence. This increase does not appear to have any relation to the influenza, as only 5 cases of influenzal pneumonia were recorded. Dysentery was again more prevalent, but Glasgow, with 10 cases, displaced Edinburgh, with 9, as the principal centre of the disease. An outbreak of mumps of unusual severity has been reported in the Isle of Harris in the Outer Hebrides. As the disease is not notifiable, exact data as to incidence are not available, but 3 deaths have been recorded so far.

Diphtheria and Scarlet Fever, 1939

In most countries of the Northern Hemisphere there is a seasonal increase of diphtheria in the last four months of each year, reaching the maximum towards the end of November and declining in December. The maximum (November–December) is a little over twice the minimum (July–August). The abnormal conditions in certain European countries as a result of war render strict comparison with previous years impossible, as it is difficult to decide to what extent evacuation and irregular, unequal, or delayed notification have influenced the numbers recorded. In England and Wales the fall observed in the first eight months of 1939, compared with the median value for the immediately preceding eleven years, was accelerated in September, while during the four-week period ended November 4 the seasonal increase was only 6.5 per cent., compared with 11.3 per cent. for the median value. In Germany (excluding Austria and the Sudeten area) incidence during summer months was greater than the median, but the increase for the four weeks ended October 7 was 21 per cent., compared with 29 per cent. in 1938. In France the decline recorded in the first eight months has markedly quickened since the war began; as against 720 cases in August there were only 479 in September, while the October numbers were below the minimum for this month of the eleven years from 1928 to 1938. In the countries of Western and Northern Europe mortality from diphtheria has fallen considerably but irregularly in the last fifty years. During the last war the rate of fall was retarded, but it has since increased. The fall has been greatest in Holland, Switzerland, and the Scandinavian countries, where the rate is less than 1 per 100,000 (the rate was 75 in Sweden at the beginning of the century), but high rates continue in Czecho-Slovakia, 14.2, and Yugoslavia, 24.6. In England and Wales the mortality rate for 1936–8 was between 6.2 and 7.3, in Scotland between 7.6 and 9.9, and in Eire between 10.7 and 11.8.

The seasonal course of scarlet fever, like that of diphtheria, is remarkably regular in European countries, with minima in July–August and maxima in October–November, but wide fluctuations occur with tolerable regularity at intervals of four to five years, during which the maximum may amount to thrice the minimum. The periodicity of scarlet fever, like that of measles, is probably related intimately to age-susceptibility and the rate of accumulation of non-immunes during the non-epidemic years. The numbers recorded in the countries at war were low in 1939 compared with the corresponding period of 1938, but in Scandinavia, Holland, and South-Eastern Europe (Hungary, Rumania, Yugoslavia, and Bulgaria) the seasonal increase was higher than in the previous year. In these countries scarlet fever has been a deadly disease since the last war, but mortality has been less in recent years—7.7 per cent. for 1936–8 (17.4 in Rumania) compared with rates of about 30 during the years 1924–33 (37.5 in Yugoslavia). During the last fifty years a regular decrease in mortality amounting to more than 95 per cent. has been recorded in England, while in Germany and France the decreases have been almost as large but not so regular.

No. 50 for 1939

INFECTIOUS DISEASES AND VITAL STATISTICS

We print below a summary of Infectious Diseases and Vital Statistics in the British Isles during the week ended December 16, 1939.

Figures of Principal Notifiable Diseases for the week and those for the corresponding week last year, for : (a) England and Wales (London included). (b) London (administrative county). (c) Scotland. (d) Eire. (e) Northern Ireland.

Figures of Births and Deaths, and of Deaths recorded under each infectious disease, are for : (a) The 126 great towns in England and Wales (including London). (b) London (administrative county). (c) The 16 principal towns in Scotland. (d) The 13 principal towns in Eire. (e) The 10 principal towns in Northern Ireland.

A dash — denotes no cases ; a blank space denotes disease not notifiable or no return available.

Disease	1939					1938 (Corresponding Week)				
	(a)	(b)	(c)	(d)	(e)	(a)	(b)	(c)	(d)	(e)
Cerebrospinal fever	25	1	5	2	—	21	4	10	—	—
Deaths		1	—				—	2		
Diphtheria	863	25	198	58	25	1,467	173	249	51	28
Deaths	14	—	7	2	4	25	3	2	4	—
Dysentery	33	1	33	—	—	36	14	20	—	—
Deaths			1	—	—			—	—	—
Encephalitis lethargica, acute	3	—	—		—	1	—	2		—
Deaths		—	—				—	—		
Enteric (typhoid and paratyphoid) fever	16	2	6	3	1	28	7	6	8	1
Deaths	—	—	—	—	—	2	2	—	—	—
Erysipelas			57	9	6			86	10	9
Deaths		—	1				1	2		
Infective enteritis or diarrhoea under 2 years										
Deaths	29	4	12	6	2	43	10	3	4	4
Measles	2,248	8	23		66		20	19		—
Deaths	—	—	—	—	2	2	—	—	—	—
Ophthalmia neonatorum	78	3	24		—	94	15	29		—
Deaths										
Pneumonia, influenzal*	450	18	5	—	21	948	116	9	4	27
Deaths (from influenza)	25	4	4	1	1	36	4	6	5	6
Pneumonia, primary			162	6				347	20	
Deaths		—		13	8		19		16	13
Polio-encephalitis, acute	1	—				1	—			
Deaths		—					—			
Poliomyelitis, acute	4	—	1		1	31	—	2		—
Deaths		—	—				1	—		
Puerperal fever	—	—	12	—	1	4	4	11	3	1
Deaths		—					1†			
Puerperal pyrexia	152	10	20		4	150	15	18		—
Deaths										
Relapsing fever	—	—				—	—			
Deaths										
Scarlet fever	1,183	36	177	69	93	1,849	151	325	76	91
Deaths	1	1	1	—	—	1	1	2	—	—
Small-pox	—	—	—		—	—	—	—		—
Deaths		—	—	—	—		—	—	—	—
Typhus fever	—	—	—	—	—	—	—	—	—	—
Deaths			—	—	—			—	—	—
Whooping-cough	1,072	7	23		11		227	375		21
Deaths	—	—	—	—	—	7	2	7	1	2
Deaths (0-1 year)	316	34	55	32	22	387	63	80	16	26
Infant mortality rate (per 1,000 live births)						64	52			
Deaths (excluding stillbirths)	4,754	731	676	207	147	4,965	921	742	207	179
Annual death rate (per 1,000 persons living)			13.7	13.9	12.9	12.2	11.7	15.1	14.0	15.9
Live births	5,360	697	784	342	179	6,321	1,183	890	357	238
Annual rate per 1,000 persons living			15.9	23.0	15.9	15.5	15.1	18‡1	24.2	21.1
Stillbirths	224	21	30			234	23			
Rate per 1,000 total births (including stillborn)			37			36	19			

* Includes primary form in figures for England and Wales, London (administrative county), and Northern Ireland.
† Death from puerperal sepsis.

Letters, Notes, and Answers

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QUERIES AND ANSWERS

Natural Antiseptics in Mouth

"J. H. G." writes: In the report of the meeting of the Section of Odontology of the Royal Society of Medicine (*Journal*, December 9, 1939, p. 1157) Professor A. Fleming is stated to have said that there are "natural antiseptics" in the mouth, and that "there was a powerful anti-bacterial substance in the saliva." I am sure that others besides myself would be interested to know precisely what these antiseptics and anti-bacterial substances are, and where one can find an authoritative account of them and of their action.

Erythema of Eyelids

"G.P." writes: May I suggest that Dr. W. A. Muir (December 16, 1939, p. 1214) try Collosol brand compound halibut oil ointment for erythema of the eyelids. I have also used this ointment with marked success in the treatment of varicose ulcers. I apply it on plain lint beneath the elastoplast dressing—very often applying the bandage adhesive side out.

Income Tax

Acquisition of Practice

"H. M." was a salaried outdoor assistant and has taken over a country practice. Can he be assessed on a cash basis?

*** As he has bought the practice debts we anticipate that objection will not be raised to his returns being on the cash basis provided that he agrees to bring into his accounts the cash received from the old debts. It is true that he paid for them, but unless they are included the cash takings will not reflect the full gross income of the practice. When the first year's liability is agreed with the inspector of taxes and "H. M." makes his declaration of total income, due regard will be paid to the fact that his private income is suffering tax at the full standard rate, and any relief due on that account will be set off against the tax due on the practice income.

Army Service—Rent of Consulting Rooms

"GAMMA" took a three-year lease of some consulting rooms two months before war broke out. Being in the Territorial Army he was called up, and since then has "been able to do no private practice." Can he claim to deduct the £250 per annum?

*** The answer depends on whether our correspondent can show that he is, in some way or other, still carrying on a private practice. If he can, then the £250 is deductible from the receipts, if any, of that practice, and the amount of any loss so calculated can be set off against his Army pay. But if he is in no way carrying on private practice there is no source of income to which the £250 can be related—it cannot be regarded as a necessary expense of his Army work. We think that the Revenue authorities would be sympathetic to any claim provided it was supported by some evidence—for example, that the name still appears on the door and that "Gamma" has arranged with some other practitioner to deal with patients, correspondence, etc.—in fact, any evidence to show that the consulting practice has not been entirely extinguished.

Division of Partnership Profits

"W." explains that A, B, and C are partners. As from January 1, 1938, C acquired an additional share and from that date onwards the profits are divisible equally between the three partners. The firm is assessed on the basis of cash receipts. How should C's proportion of the firm's assessment be dealt with after January 1, 1938?

*** On the basis of one-third. It is of course true that C's cash receipts will be below that level, as they will reflect the lower share he formerly had, but the assessments after January 1, 1938, are in respect of the income of the period for which they are made, and C has a one-third share of that income. Any unfairness on C arises only because taxpayers are required to pay tax on income that has accrued whether he has received it or not; the cash basis is merely a convenient method of calculating the "earnings." Section 20 of the Income Tax Act, 1918, provides that "the income of a partner . . . shall be deemed to be the share to which he is entitled during the year to which the claim [or assessment in this case] relates."

LETTERS, NOTES, ETC.

Pictures of Opium and its Alkaloids

To decorate their calendar for 1940 J. F. Macfarlan and Co., manufacturing chemists, of Elstree Way, Herts, have obtained photographs of the two forms of opium chiefly used in the manufacture of opium alkaloids and of two of the most characteristic forms of the latter—cubes of morphine hydrochloride and crystals of codeine. Up to the formation of the monopoly by the Turkish and Yugoslav Governments opium found its way from those countries through merchants in Smyrna, Salonika, and Constantinople. The pieces as collected from the peasants varied in size from a few ounces up to 4 or 5 lb., and the content of morphine showed very great variations—from 6 to 14 per cent. The pieces were sometimes highly adulterated with apricot fruit and other substances. Now the pieces as collected from the peasants are intimately mixed at central collecting stations and issued as "cheeses" weighing 2 kilogrammes each. The opium content is standardized at set percentages, according to the market for which the opium is designed. Yugoslav opium is sent out in oblong blocks weighing from 5 ounces to 16 ounces each. Persian opium, while unsuitable for the preparation of galenicals, is largely used as a source of morphine and the other alkaloids of opium. It reaches this country in "bricks," wrapped in red paper, weighing about 1 lb. each. At one time its contents varied somewhat, but by reason of more careful preparation at central stations in Persia the bricks can now be depended upon to yield a regular percentage, which varies, as in the case of Turkish and Yugoslav opiums, according to the market to which it is to be exported.

Blood Grouping for All

"LAYMAN" writes: It is good news that blood for transfusion purposes can now be stored, and that quantities have been sent out for the use of our troops in France. But what about the blood grouping? If it is essential that blood should be administered according to the blood group of the patient it would obviously be helpful in an emergency if that group had been ascertained beforehand. In an advanced dressing station a doctor would hardly have the means or time to carry out the necessary tests, and consequently the wounded soldier would thus lose the chance of life offered by this particular treatment. Surely the blood group of a soldier could be ascertained at the time of his enlistment or inoculation and the information recorded on his identity disk. A similar precaution might be taken in the case of civilians, their group being noted on the identity card. If the medical authorities would provide the necessary facilities and arrange, possibly, for a standard fee, civilians could be encouraged to submit to the test.

Gas Injuries to the Eye

"R. F. W." writes: In connexion with the recent letters on the treatment of mustard-gas injuries to the eye, and particularly that of Dr. M. Lichtenstein (*Journal*, December 30, 1939, p. 1295), I would like to quote the following from *Chemicals in War*, by A. M. Prentiss (1937), page 184: "It [mustard gas] is rapidly dissolved by the organic solvents, such as ether, chloroform, and acetone, by the light paraffin hydrocarbons, and by all the organic fats, both animal and vegetable. It is, however, soluble only with difficulty in the mineral oils, and in vaseline and paraffin."